

# Suggestions and Assumptions about Establishing “Engineering Technology College” in Key Universities of China

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**Abstract**—University graduates have difficulty in finding a job, however, industries cannot be satisfied with the actual needs of talents and the strategic needs of talents as China is experiencing a national industrial transformation and upgrading. The deployment that China made to speed up developing modern vocational education has provided a direction for solving employment structural contradiction. Therefore, 985 universities as the representative of national key universities should actively set up the reform and innovation of the talent nurturing mode and graduates employment mode. Accordingly, this paper discusses simply on establishing “engineering technology college” of which the specified task is to educate high-level skilled talents from the aspects of organization structure, faculty construction, admissions, school-enterprise cooperation, training plan formulation, and etc.

**Keywords**- *The reform of higher education, the structural contradictions in employment, skilled talents, academic talents, College of Engineering Technology*

## I. HOW TO IMPROVE EDUCATION FOR THE SATISFACTION OF PEOPLE?

The report delivered on the Eighteenth National Congress of Chinese Communist Party advances the objective of “trying our utmost to improve education for the satisfaction of people”. The objective’s implications may well be re-expressed as that the current educational work is not a satisfactory one on the whole. As a member of the higher education, the author cannot help but reflecting why students, their families and work units are commonly unsatisfied with higher education? And what are the “diseases” in China’s higher educations?

In the aspect of school running idea, domestic universities often pursue the large and the comprehensive with a result of doing no good though they want to do things well and wasting significant resources. Due to their excessive pursuit of all kinds of ranks and achievements, the phenomenon of seeking quick success and instant benefits happens to many domestic universities, causing that schools don’t make great efforts to study educational and teaching rules for improving the quality of talent training. At the same time, they don’t have enough power and ability to actively serve economic and social development.

In terms of the construction of teaching staff, “inbreeding” is a very prominent phenomenon between domestic universities. They put undue emphasis on highly educated background (for example, some domestic universities added a group of young teachers who retain to work in their college after obtaining doctor’s degree into the team of experimental teachers in recent years, but most of these young teachers are still engaged in the research work in the tutor’s team, of which they were a member when pursued the PhD, and weren’t put into experimental teaching in fact. Even though this staffs are really put into experimental teaching, it is difficult for their experimental teaching level to get great improvement in a short term, because they received little special and systematic training of experimental teaching. This creates an illusion that the level of experimental teaching in universities has been improved with a higher doctor rate in the team of experimental teachers. However, the fact is not like that.) Most of teachers lack the working experience in enterprises, and there is not enough interaction between universities and enterprises in the aspect of talent training.

Regarding the training scheme and curriculum design, domestic universities usually revise and adjust in the process of its development, but it is still hard to make the combination of production and learning adapt to the demands of the industry initiatively. In the aspect of the objectives of talent training, domestic universities generally have the problems of inaccurate positioning and have difficulties in consciously taking the industry’s realistic demands for talents or the strategic demands of the national industrial transformation and upgrading for talents as the target wizard. For the teaching content, the theoretical teaching is emphasized, while the practical teaching is either not enough or of low quality. The combination of theory and practice is insufficient. And the teaching methods are mainly indoctrination in the whole class “with the center of teacher”, while teachers rarely apply elicitation and discussion method of teaching “with the center of students”. When the schools assess and evaluate students, theoretical learning and exam results are stressed, while the examination on students’ innovation ability, practical ability and other comprehensive quality is ignored.

These problems are reflected on the graduates from domestic universities in the following ways:

1. Ideological rigidity, lacking innovation consciousness and innovative ability;
2. Great ambition but little talent, not strong ability of applying learned knowledge and skills to solve practical problems in a comprehensive way, and especially poor practical ability;
3. Obsolete knowledge, narrow structure, lacking personalized training and sustainable development;
4. Limited knowledge and scanty information, being short of international view and poor ability of cross-culture communication;
5. Poor communication, lacking experience of team work, and poor communication skills;
6. While applying for a job, having blind confidence or thinking lightly of him, being short of the knowledge of modern enterprises' culture and workflow, and requesting too high wages, and working and living conditions at the same time.

Therefore, students complain that teachers hype all kinds of theories in the school, but they are short of the opportunities of internship and practice, so as to have great difficulties and pressure in job application. Parents complain that their children spend a lot on schooling and living expenses at school and the family cost everything to afford, however, their children wait for employment or continue living off parents or can not find an ideal job after graduation. This brings about a great clamor of "uselessness of study theory" in a period of time, while employers are faced with "labor shortage" and don't know how to recruit qualified skilled talents.

This causes the contradictions between difficult employment for university graduates and the industry's realistic demands for talents and the strategic demands of the national industrial transformation and upgrading for talents. This structural contradiction of employment can't be solved fundamentally, thus it is difficult to expect people to satisfy for our higher education.

## II. WHAT WOULD BE REFORMED IN THE "FIRST YEAR" OF DEEPENING THE HIGHER EDUCATION REFORM COMPREHENSIVELY?

Universities train millions of "qualified" graduates every year, while the industry can't recruit any "qualified" skilled talents, which makes some people confused more or less.

In order to eliminate the structural contradictions of employment, the Ministry of Education launched "Excellent Engineer Training Plan" in 2010. This plan is the major reform project to implement the Outline of National Medium and Long-term Educational Reform and Development Plan (2010-2010) and the Outline of National Medium and Long-term Talent Development Plan (2010-2010), and also the major move to promote our country towards the powerful nation of engineering education from the large country of engineering education. The target of this plan is: to face the industry, the

world and the future, to train a large number of engineering talents of high quality and of various types who have strong innovation ability and can meet the demands of economic and social development, to lay the solid advantages of human resources for realizing industrialization and modernization, and to enhance our country's core competitiveness and comprehensive national strength [1].

At present, there are up to more than 300 universities approved to join in "Excellent Engineer Training Plan", accounting for about 1/3 of our country's undergraduate universities that set up engineering majors. Because there are limited universities and majors taking part in, this plan plays an illustrative and instructive role in promoting universities to train talents to meet the market demands to some extent, but the practical experience indicates that it is not practical to eliminate the structural contradictions of employment fundamentally only through this plan.

2014 is the "first year" of deepening the reform comprehensively in China. In order to solve the structural contradictions of employment, to enhance the labor force's employment and entrepreneurial ability, and the quality of industry and national comprehensive strength, the executing meeting of the State Council made the deployment to accelerate the development of modern vocational education on February 26th, 2014 [2]. So as to implement this deployment, on March 22nd, 2014, the vice minister of the Ministry of Education, Lu Xin, elaborated on promoting the establishment of modern vocational education system and other issues when he attended "2014 Annual Conference of China Development Forum" [3]. Lu Xin thinks that the basic characteristics of the modern vocational education system are mainly reflected in five aspects:

1. Take the employment as the guidance, and especially provide service for youth employment.
2. Build systematic training system of technical and skilled talents.
3. Make the combination of production with learning and the university-enterprise cooperation throughout in the whole process of system construction.
4. Construct the overpass of talent growth that is open and connects the internal and the external.
5. Give full play to the role of the market, and fully mobilize social resources.

Lu Xin expressed that the Ministry of Education would put efforts to advance the reform in 4 key fields centering on the above five aspects, to bring the vocational education into full play on creating talent dividend and creating employment:

1. Reform the system of college entrance examination, and introduce two modes of college entrance examination, the examination of skilled talents and of academic talents.
2. Greatly promote the school running level of existing vocational colleges, and improve and perfect the connection system between secondary vocational colleges and higher vocational colleges.

3. Guide the transformation of part of local undergraduate universities into the universities of application technology type, to ease the employment difficulties of university graduates fundamentally.

4. Insist on the vocational education being offered to everyone, and strengthen the inclusiveness and openness of the vocational education.

The community has relatively high expectations on solving the universities' problems in the aspect of talent training and graduate employment through deepening the reform comprehensively.

However, there are some doubts about the reform scheme elaborated by Lu Xin, especially about the Ministry of Education's work of transforming over 600 local undergraduate universities into the type of application technology and vocational education in the society [4]. The newly-built undergraduate universities are the key of these local undergraduate universities of more than 600 that have weak teaching staff, teaching level and quality needed improvement and other problems, because of the combined influences of history, insufficient investment and other factors. These universities are naturally at a disadvantage compared with the strong 985 colleges and universities in terms of the training of academic talents. This only means that these universities are difficult to train academic talents of high quality, but doesn't mean that these undergraduate universities have outstanding advantages in training skilled talents. The 985 colleges and universities are not the same, and these universities can train not only academic talents but also skilled talents. During the reform, deliberately weakening the universities' training of skilled talents is absolutely a disaster to the country and the nation.

The target of comprehensively deepening reform is worth looking forward to admittedly, but whether our reform measures take the influences of all factors in to consideration in an overall, deep and comprehensive way, can it minimize the failure risks of the reform? These need careful consideration.

### III. DOMINANT FACTORIES AND UNIVERSITIES SHOULD BE CONCERNED ABOUT NATIONAL DESTINY ---- TAKING HARBIN INSTITUTE OF TECHNOLOGY AS AN EXAMPLE

The comprehensive and deep reform of higher education is the key of deepening the comprehensive reform in the field of education, and is the focus of society. It needs the top-down reform led by the Ministry of Education and other ministries, and also needs the top-down reform and innovation of talent training mode and graduate employment mode led by the national key universities. Dominant factories and universities should be concerned about national destiny. This is a kind of conscious and responsible behavior, but never an empty slogan.

In 1920, in order to cultivate engineering and technical personnel, the Middle East Railway Administration started Harbin Sino Russian Industrial School, which was the predecessor of Harbin Institute of Technology. After graduation, the students were titled as "engineer", which makes Harbin Institute of Technology known as "the cradle of engineers" all over the country.

On September 15th, 1958, Deng Xiaoping, the general secretary of the Secretariat of the CPC Central Committee, vice premier of the State Council at that time, made important indications when he went to Harbin Institute of Technology for inspection: "dominant factories and universities should be concerned about national destiny, and higher schools should become the cornerstone of breakthroughs in science and technology." Thereafter, Harbin Institute of Technology keeps pace with the times and tightly ties its own future and destiny to that of the country and the nation [5].

Today, Harbin Institute of Technology's own position is: a national key university in the domestic first-class level that has relatively great influence in the world and is multi-disciplinary, open and research-based [6].

Even though, the undergraduate graduates from Harbin Institute of Technology are not all academic ones. From the statistics of classified employment situation of a college from 2008 to 2011, it can be seen that there are about 40% of students on average in the college choosing to work in enterprises after graduation every year. We can tell from the college's example that Harbin Institute of Technology not only trains a large amount of "qualified" academic talents, but also export massive "qualified" skilled talents of high level to the country and the industry.

TABLE I. STATISTICS OF CLASSIFIED EMPLOYMENT SITUATION OF A COLLEGE IN HARBIN INSTITUTE OF TECHNOLOGY FROM 2008 TO 2011 (INCOMPLETE STATISTICS)

<i>Year of graduation</i>	<i>Becoming graduate student</i>	<i>Going abroad</i>	<i>State-owned enterprises</i>	<i>Private enterprises</i>	<i>Foreign funded enterprises</i>	<i>Others</i>
2008	45.28%	4.91%	32.45%	2.26%	6.80%	8.30%
2009	49.80%	3.61%	30.12%	1.20%	8.84%	6.43%
2010	45.59%	4.04%	31.99%	1.47%	7.72%	9.19%
2011	46.01%	9.13%	29.66%	1.90%	6.10%	7.20%

Same with Harbin Institute of Technology, the other 985 colleges and universities also have a glorious history and make an outstanding contribution to the nation and society on talent training and transport. In the first year of comprehensively deepening the reform, the employment structural contradiction,

which was faced by the nation in the aspect of accelerating the transformation and upgrade of the industry, becomes increasingly prominent. As a typical representative, the national key universities represented by the 985 colleges and universities should come forward bravely and make new and

greater contributions to the country on the training of high-level and skilled talents.

1. The skilled talents are not inferior to the academic talents. It is basically impossible for schools of weak foundation to reach targets quickly and to meet the demands of society and the nation for talents. The key universities should take the lead in reform to prevent the reform from being destroyed in one day. This is not the face problems of putting down the figure or not, but the strategic problems concerning the future and fate of the country and the nation. Dominant factories and universities should be concerned with national destiny, and there is no reason for the national key universities represented by the 985 colleges and universities not to come forward.

2. The demonstration and leading role of elite schools played by the gilded signboards of the 985 colleges and universities, trains and leads correct view of employment and occupation especially among the students and parents in the society. The 985 colleges and universities and other national key universities should consciously train and send teachers to other universities that undertake tasks of vocational education.

3. For the doubts about the forthcoming reform scheme of the Ministry of Education and worries about the failure risks in the society, the key universities' own reforms play a role of experimental field and buffer and provide a reference for comprehensively deepening the reform in the field of higher education through continuously exploring the road and experiences

#### IV. SOME TENTATIVE IDEAS ABOUT "COLLEGE OF ENGINEERING TECHNOLOGY"

Based on the above analysis, the author thinks that the national key universities represented by the 985 colleges and universities should carry out discussions on establishing "College of Engineering Technology" in their school as soon as possible, and focus on studying how to train high-level engineering and technical personnel, who meet the demands of national industry's accelerating transformation and upgrade and carrying out innovation development strategy, through the combination of production and education, school-enterprise cooperation, the combination of working and learning and other models.

The national key universities represented by the 985 colleges and universities accumulate lots of experience in training special engineering and technical personnel of high level. For example, Chinese Guangdong Nuclear Power Group (called CGNPG for short) began to train prospective employees through carrying out the cooperation between the enterprise and part of domestic universities. This kind of "order-based" talent training and employment mode enjoys a good reputation with schools, enterprises, students and parents. Many domestic universities began to join in "Excellent Engineer Training Plan" in succession from 2010 and have already gathered some experience in the joint training of schools and enterprises. Domestic key universities generally have a long history and solid strengthen, as long as they truly change the idea of talent training, sum up the experience, make scientific planning, guarantee the investment and strengthen the management, they

surely can train the high-level engineering and technical talents who meet the demands of the industry and the country.

In order to realize this target early, consider to set up "College of Engineering Technology", which will undertake the training work of high-level engineering and technical personnel, in these domestic key universities as soon as possible. The newly established "College of Engineering Technology" should pay great attention to the quality from the very beginning, take the quality as the lifeline and create its own brand of engineering education. The graduates from this college will struggle to work in domestic and foreign famous enterprises and research institutes in the future. Promote school running diversity and flexibility and the formation of new characteristics of domestic key universities, realize cross and compound training of engineering an academic talents of undergraduate, masters and doctors, and meet the demands of the country and the nation on skilled and academic talents of different levels and high quality through "College of Engineering Technology".

Considering the organization structure, "College of Engineering Technology" can be established relying on the earliest software colleges in these domestic key universities. These colleges can absorb some of their own traditional superior majors and urgently needed majors in the society, such as material science, mechanism and electricity, energy, electronics, computer, software, chemical industry, management and so on. The quantity of majors should be controlled to 10-15, and each major has a class at least with students of less than 30. The total student quantity of each session in the college had better not surpass 10% of total students enrolled in of the school at that year.

There two models of enrolling new students: the first is to directly enroll through college entrance examination and the second is the two-way choice according to individual achievements and aspiration among all students after a year of admission (the students who are selected to the majors of "College of Engineering and Technology" have priority). It is not encouraged to attract students to choose "College of Engineering and Technology" through lowering the admission scores and the students in "College of Engineering and Technology" must possess clear employment goals. These don't mean that schools need to reduce the quality of students. For the students who have family difficulties and are excellent in character and learning, if they are selected into "College of Engineering and Technology", the school can reduce or remit tuition, issue scholarship or grants and provide them with other preferential conditions. The students whose scores rank top 20% of each major in "College of Engineering and Technology" have opportunities to study for the master of engineering without examination through recommendation.

The business liaison committee should be established and be responsible for the overall communication and coordination with enterprises of talent training, internship and practice in enterprises and employment after graduation. While drawing up training scheme, teaching plan and teaching program, fully consider the demands of the industry and the country, and draw up with relevant enterprises together. The construction of teaching staff mainly focuses on school teachers, transfers

some teachers from each college and each major to “College of Engineering and Technology” for full-time teaching and scientific research, and also transfers some for part-time teaching and scientific research, and recruits some high-level management and technical personnel in enterprises with industrial background and experience as supplementary teaching staff. Besides the teaching staff provided by the school, the high-level management and technical experts from enterprises of each major should set up the courses with a proportion of no less than 40%. The practical teaching is mainly in the enterprises, supplemented with the national and provincial experimental teaching demonstration center in the school. The time of students’ practical learning in enterprises should be no less than 3 complete semesters (no less than 4 complete semesters for students of five-year system). In the conditional majors, students should pass the relevant qualification certification within the industry of the major while graduation.

Whether the establishment of “College of Engineering and Technology” should be applied or reported to the Ministry of Education, other ministries, provinces and cities where the school locates, the school should designate special departments or found a preparatory group of “College of Engineering and Technology” to take the charge, and try to obtain a full range of support from the Ministry of Education, other ministries, and the provinces and cities where the school locates in the aspect of funds, personnel, equipment, enterprises of joint training.

The most intense competition in 21st century is the talent competition. In the background of global economic integration, this competition comes from both the domestic and overseas. It

is not the competition of single skilled or academic talents, but the competition of inter-disciplinary talents who are knowledgeable about various subjects. Whether skilled talents or academic talents, every school can make plans for training and comprehensive balanced development according to its own actual situation, and needs to design the transformation mechanism of training talents of different types within the school or in a larger range, so as not to label students and not to deprive students’ opportunities of personalized training and sustainable development. The success of talent competition depends on education. The education reform is a systematic project, and needs not only bold innovation, but also making progress while maintaining stability.

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