Consensus and Key to Solve the “Non-engineering” Problem of Engineering Teachers in University

Dan Wang¹ and Ji-Feng Wang²

Abstract: The problem of de-industrialization university faculty is not bound to affect the quality of engineering education in our country and national strategy. With the advent of Industry 4.0, it is particularly urgent to solve the problem of non-engineering engineering faculty. This is a government, researcher, and related Two basic consensuses have been formed between universities and enterprises. The key reason leading to the "non-engineering" problem of university engineering teachers is in the government. Therefore, the key to solving problems is the reaction of the government. The perfect solution of this problem lies in giving full play to the governments’ leading and management functions. The government must promote the establishment of special mechanisms for relevant parties, and even promote the people’s congress legislation, so as to fundamentally provide protection for the “non-engineering” problem of the engineering teachers in university.

Keywords: Engineering teachers; “Non-engineering”; Consensus; Key

INTRODUCTION

The "Decision of the Central Committee of the Communist Party on Educational System Reform" issued on May 27, 1985, more than 30 years since its implementation, the educational system has improved, the division of universities and the pattern of industry running have generally been broken, but university engineering teachers are increasingly lacking necessary engineering practices. Background, which shows a serious tendency to de-engineering, deviates from the practical nature of engineering education. This is the “non-engineering” tendency of engineering teachers that people often worry about.

The existence of this tendency directly has a bad influence on the quality of engineering education in China and the realization of national strategies such as building a world-class university. The key to correcting this tendency lies in the government.

It must be led by the government and seek effective mechanisms and realistic models for engineering teachers, such as universities, governments, and enterprises, to cooperate and win together. This will provide a solution to the non-work problems of university engineering teachers. Institutional guarantees, policy support, financial support, and other comprehensive protection mechanisms.
1. A consensus has been established to solve the problem of non-engineering teachers in China.

Ten years ago, both the education administrator and the education researcher had reached a consensus on the importance of the engineering practice level of engineering teachers in teaching quality and personnel training when analyzing the problem of engineering faculty at the time, and pointed out that at that time our country Engineering teachers lack serious problems in engineering practice experience and experience—engineering teachers do not understand engineering, and cannot understand and master new information and situations on the production site in a timely manner, and are incapable of training and training students' professional practice abilities. In a survey of academicians of the Chinese Academy of Engineering, college teachers, and corporate engineering technicians, as many as 93% of respondents believe that the main factors affecting the quality and development of engineering education in China include “lack of engineering practice background Teacher team." [1]

The widespread consensus reached 10 years ago that the problem of non-engineering in engineering teachers has not been effectively solved and thus has been of concern to relevant researchers for 10 years. On December 5th, 2016, the “full text” search in China How Net included 95 items of journal articles on “university teachers' non-working”. Since 2007, several papers have been involved in this issue each year since 2007. Research has gradually deepened, and the problem has been solved. There is further consensus on the urgency and possibility.

To a certain extent, it can be said that the Chinese government has reached consensus on many aspects of solving this problem, such as strengthening school-enterprise cooperation and upgrading teachers' social practice opportunities. For example, in 2010, the Outline of the National Medium and Long-term Education Reform and Development Plan (2010-2020), the 2012 State Council Opinions on Strengthening the Construction of the Teaching Staff (GF (2012) No. 41), and in 2015, the State Council “coordinated the promotion of the world". The government documents that have a far-reaching impact, such as the First-Class Universities and the First-Class Discipline Construction Overall Plan (GuFa [2015] No.64), emphasize school-enterprise cooperation, industry-academia cooperation, teacher social practice, and encourage relevant departments and industry enterprises to actively participate in teacher practice. The level of promotion work is directly related to solving the non-work problem of university engineering teachers.

The problems that exist today are mainly the implementation of the mechanism. At present, there are no specific norms and mechanisms that have been specifically designed to solve the problem of non-engineering in engineering teachers.

2. The approach of the Industrial 4.0 era makes it very necessary to solve the problem of unengineered university engineering teachers.

According to the International Standard Industrial Classification, out of the 22 categories, China ranked first in 7 major categories, and the output of more than 220 industrial products such as steel, cement, and automobiles ranks first in the world. There are various problems: low investment return rate, large resource consumption, poor ability of independent innovation, hollow technology, lack of independent brands, etc. At present, China is still at
the low end of the global value chain, [2] with the advent of the Industry 4.0 era As well as the implementation of a series of strategic plans such as the national “Made in China 2025” strategy and the construction of first-rate universities, the task of improving the quality of engineering education has also become increasingly urgent. The tendency of engineering teachers and their solutions have received increasing attention. Many studies have revealed the urgency and necessity of resolving non-engineering-related issues in terms of specific quantities and even the level and quality of engineering practice.

The unworkable tendency of engineering teachers is a common problem faced by engineering education in all countries in the world, but it is particularly evident in China. As in Germany and other countries, professors at the University of Applied Technology often have many years of work experience in the industry, and the non-working tendency is far behind that of China. A survey published in August 2016 on a sample of more than 50 undergraduate colleges of 19 “985 Engineering” colleges, 15 “211 Engineering” colleges and 16 local undergraduate colleges shows that from full-time companies Experienced and engaged in the research and development of projects related to the two dimensions, China's engineering teachers of engineering practice experience is very lacking, there is no full-time enterprise experience and has not engaged in engineering-related projects, research and development accounted for 30% or even 70%, non The problem of industrialization exists objectively. The specific situation is that the proportion of full-time enterprise working experience among local full-time undergraduate colleges has the highest proportion, accounting for 47.95%; followed by the “211 Project” colleges, the proportion of teachers with full-time corporate working experience is 37.59%; and “The proportion of full-time corporate work experience in the 985-studded college and university full-time faculty is the lowest, only 31.74%. At present, of the engineering faculty of different types of institutions in China, among the full-time faculty members of the "985 Project" colleges, the highest percentage is engaged in research-related R&D projects, accounting for 78.16%; the "211 Projects" universities are the second, with engineering-related The proportion of teachers experienced in R&D projects is 71.83%; the proportion of full-time R&D projects in local undergraduate colleges with project-related R&D projects is the lowest, only 59.03%. [3]

In August 2016, there were data showing the same situation. There are 1,767 full-time teachers in a 211 college in Shanghai, of which 1091 are engineering teachers. In the three years from 2012 to 2015, the total number of engineering teachers in schools has increased, the scale has shown a slight increase, and they have certain engineering experience. More than 60% of teachers have participated in engineering practice research or training, [4] In other words, there are still more than 30% of engineering teachers belong to the scope of "non-engineering".

Non-working has caused great restrictions on the improvement of the quality of engineering education in China. Such recognition has been widely recognized, and indeed it is. According to the “World Competitiveness Report” issued by the Swiss International Management Institute in Lausanne, although the total number of researchers and developers in China, the total number of researchers and developers in the enterprise, and the number of patents granted each year have been among the highest in the world, In terms of “amount of qualified engineers available” and “number of effective patents”, China has been at the end of the year since 1999, and the disadvantages are obvious. Until 2008, it ranked 48th out of 55
and it left the weakest for the first time. "Weaknesses" (island International Management Institute, Lausanne, Switzerland). Although China has become a major country in engineering education, the ranking of Switzerland shows to a certain extent that the quality of Chinese engineers and the quality of engineering education need to be improved. In the survey of 5,000 engineers and technicians across the country by the Chinese Academy of Engineering, 21.8% of the respondents believe that the students in colleges and universities do not meet or basically do not meet the needs of the country’s technological development; 52.4% of the respondents believe that the university’s engineering profession the quality of students is average. [5]

More than 90% of the experts and scholars in the "Survey of China Engineering Education for Innovation-oriented Countries" carried out by the task force of the "Engineering Education for Innovative Countries" major project of the Ministry of Education's Strategic Research in 2006 believe that "there is a lack of engineering The teaching staff in practical background is the most important factor restricting the quality and development of engineering education in China. [6] Wang Sunyi, a professor at the Institute of Education at Tsinghua University, also pointed out at a conference: "In the rapid development of advanced engineering education in our country, we are also faced with many problems and challenges, mainly reflected in the general lack of engineering experience in engineering faculty. It seriously affects the quality of engineering education......" [7] Prof. Ming Xian, an Academician of the Chinese Academy of Engineering, wrote that: "The engineering teachers themselves lack the experience and ability of engineering practice, which is very unfavorable for improving the quality of undergraduate engineering education."

3. The key reason leading to the "non-engineering" problem of university engineering teachers is that the government's functions are not enough.

The major Western developed countries all regard strengthening and reforming engineering education as the foundation of the country, and engineering education has quietly become a key magic weapon to build national competitiveness. Western developed countries have taken the first step in engineering education reform and the correction of non-work engineering teachers. There are many lessons for us to learn from and draw lessons from, including giving full play to the role of the government. Take the example of the United States, which has a highly developed engineering education. Although the United States generally has a "small government" and its government functions are relatively small, more and more literature emphasizes the government's role in engineering education. In the 1990s, a wave of "return to engineering" began. This wave is mainly directed at the phenomenon that traditional engineering education places too much emphasis on specialization and science and thus splits the project itself. This includes efforts to change the tendency of engineering teachers to become unworkable. In recent years, various reports on engineering education reform have been issued each year, and even directly linked the quality and level of engineering education with national security. For example, in 2001, the American Academy of Engineering and the National Natural Science Foundation of the United States jointly initiated the "2020 Engineers" program, and at the end of 2004 released "Engineers of 2020: Visions of the New Century Project" (The Engineer of 2020: Visions of Engineering in the new Century). In the summer of 2005, "Educating 2020 Engineers: Education for the New
Century" was published (Educating the Engineer of 2020: Adapting Engineering Education to the New Century). Both of these reports, which have aroused strong response, have all taken note of the importance of government's state to the development of engineering education.

However, in China, despite the Outline of the National Medium- and Long-Term Education Reform and Development Plan (2010-2020) as early as in 2010, the State Council's “Opinions on Strengthening the Construction of the Teaching Staff” (Gongfa [2012] No. 41, 2015 The State Council’s "Overall Plan for Overall Planning for World-Class Universities and First-Class Universities" (Guo Fa [2015] No.64) and other documents all emphasize school-enterprise cooperation, industry-university cooperation, and put forward "establish and improve school-led, industry-guided, and enterprise-affiliated schools." Mechanisms to formulate laws and regulations for promoting school-industry cooperation and promote the school-enterprise cooperation system. The establishment of a new mechanism for the joint training of teachers in institutions of higher learning and local governments, primary and secondary schools (kindergarten and vocational schools), and the development of "dual-qualification" enterprises in industrial enterprises. The role of teachers is to establish requirements such as “establishing domestic visits for young and middle-aged teachers in institutions of higher learning, training for job placement, and social practice systems”, and “accelerating the perfection of the model of close cooperation with industry enterprises”. “Encourage relevant departments and industry enterprises to actively participate in first-class universities and "First-rate discipline construction" reform tasks or support measures. However, these requirements, tasks and measures are only principled, and there is no specific specification and mechanism design for the non-working issues of university teachers.

Moreover, for a long time, various principle requirements have not been effectively implemented. The lack of concrete measures to solve non-work-related problems has actually led to the absence of government functions, which has caused schools, enterprises, and teachers and students to solve problems. The non-work-related issues have low enthusiasm, instability, unsustainability, and lack of strong incentives and guarantees. At the many stages of demobilization and formation of non-working industries, the following four aspects have brought about problems related to insufficient government functions. Directly strengthen the tendency of non-workers in chemical engineering teachers.

The first, since the late 1970s, engineering education has gradually become pan-scientific, scientific theory education has become increasingly "centralized," and engineering practice training has gradually become "marginalized," long-term professional division is too narrow, and personnel training has become small and hollow. As a result, the environment is not effectively controlled by the government. The growth and positioning of engineering teachers naturally will be affected, and the trend of non-workers will begin to sprout.

The second, most of the engineering faculty members directly come from engineering graduates graduated from higher engineering colleges. Under the traditional engineering education model dominated by the Chinese government, they lacked sufficient engineering practice training and engineering education ability in their student days. The correction of inclination lacks the foundation.

The third, in the recruitment process of college engineering teachers, only “Bo” is a move, and the evaluation of engineering teachers oversees the heavy results. The inadequacies in the
recruitment and management and evaluation of college engineering teachers directly promote the non-engineering of engineering education teachers and the trends of de-industrialization.

The fourth, as one of the important methods for the on-the-job training of engineering teachers, corporate practice exercises cannot be effectively implemented. For the sake of self-interest, enterprises cannot actively and actively fight for the various types of personnel that universities go to practice. The initiative is not even welcome, and the non-engineering trend is becoming more and more obvious.

In view of the above reasons, in order to solve the non-engineering problem of engineering teachers, many universities in China have taken steps to reform in research and practical exploration, and proposed the “school-enterprise synergy education model” (such as the University of Petroleum), “perfect School-Enterprise Cooperative Safeguard System", strengthening the construction of "dual-qualified" teachers, diversified evaluation standards for engineering teachers, and strict entrance of engineering education teachers, etc. Papers on the theme of non-engineering for engineering teachers" have also appeared, such as Chen Bin, et al.'s "Implementing a Comprehensive Engineering Education Reform for Non-Working Trends of Engineering Teachers" (Chemical Higher Education, No. 1 in 2008), Chen Hongrong's "From the Great Country of Engineering Education to the Road to Strong Engineering Education" (Test Weekly) And so on, but from the overall situation of the country, there is still a lack of deep-level analysis of the causes and overall countermeasures. Some schools have called for more practice and research. Some researchers have explored ways to solve problems. However, both theorists and practitioners lack specialized exploration of government-related functions. It is even more difficult to provide legislative support for their exploration.

Obviously, the above reasons and the problems that they cause are actually related to the insufficiency of the role of the government. In fact, the solution to the non-work problem of university engineering teachers is the responsibility of the government and its role is irreplaceable.

4. The key to solve the "non-engineering " problem of engineering teachers in university has to be the government functions

In the process of improving the quality of engineering education and strengthening the construction of engineering education teachers, the government, schools, and enterprises are in different positions and play different roles. Only the organic combination of the three can ultimately achieve a “win-win” situation. Among these interacting factors, Zhu Gaofeng, former deputy president of the Chinese Academy of Engineering and academician of the Chinese Academy of Engineering, already pointed out that "the key to solving the problem of engineering education in China lies in the government." Some problems existing in the construction of engineering education faculty are not certain. Schools, districts, and industries can only resolve to the national level. Within the framework of the national mechanism, the direction, procedures, and standards of the training of engineering teachers are guaranteed in the form of policies, standardized by institutional means, and economically motivated. To be helped, the non-engineering problem is expected to obtain a mechanism for continuous reversal.

Based on the above-mentioned consensus of governments, researchers, relevant universities and enterprises in China, and the urgency of solving the non-work problems of
university engineering teachers with the advent of the Industry 4.0 era, it has led to the deepening of the problem of "non-work" in university engineering teachers. The reasons for this are to propose that we give full play to the leading role of the Chinese government and promote the establishment of special mechanisms to provide a guarantee mechanism for fundamentally continuing the solution to the non-engineering problem of the engineering teachers in university.

Specifically, it is suggested that the following five aspects should be taken into consideration to vigorously bring into play the functions of leading, leading and managing of the Chinese government so as to promote the early formation of a mechanism for solving the non-engineering problems of university engineering teachers.

1. All government departments fully understand the negative impact of non-university teachers on the quality of higher engineering education and national strategies, and establish a sense of responsibility and urgency to solve problems.

2. The State Council has formulated specific normative documents to guide the recruitment of engineering teachers, providing guidance and guarantees for the university from the aspects of practical ability, corporate work experience and other aspects.

3. The Ministry of Education commissioned or set up a specialized agency to take the lead to study and formulate specific policies to guide and encourage the engineering teachers to work full time in the company.

4. The state finance set up special funds to increase the support for research and development projects related to engineering practice.

5. Through proper and effective channels, efforts are made to promote the legislation of the National People's Congress, to provide legal protection for school-enterprise cooperation as a whole, and to promote the unproved-habitation of university engineering teachers to reverse the work.

References
About the author
1 Wang Dan (1974- ), female. Assets division of Chongqing University of Posts and Telecommunications. Main research direction: research on higher education management.
2 Wang Jifeng (1944- ), male, Professor. College Mobile Telecommunications of Chongqing University of Posts and Telecom. Major research direction: modeling and application of complex control systems.

Foundation Project
1. Education Reform Project Higher Education electrical engineering Teaching Steering Committee of Education Ministry: Research on the collaborative education of electrical professionals in applied technical colleges based on university-enterprise cooperation innovation platform. No. DQJZW2016011

Contact Address: Assets Division, Chongqing University of Posts and Telecommunications, PC 400065, Chongqing City
Mailbox: wangjf@cqupt.edu.cn 1305797189@qq.com