

Discussion of Curriculum Reform Towards Developing Innovative Engineers

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Abstract—Engineering and technological development has always been based on demand-driven, and major projects are the basis to develop innovative engineering. China is in the era of rapid development of industrialization, information technology and urbanization, which is of great opportunities to develop innovative engineering. Starting from the goals and objectives to develop innovative engineering, combined with practice - based teaching system of certification courses, this paper explores curriculum reform ways to develop innovative engineers. Practice has proved that the reform of teaching methods is conducive to promoting the development of innovative engineering, so to improve the competitiveness ability of graduates.

Keywords—innovative, demand-driven, curriculum reform, training mode

I. INTRODUCTION

At present, nearly 40 percents of employers around the world are difficult to find the right talents [1] in the market to fill the vacancies, and the scarcest of the first three categories of personnel are business representatives, engineers and technicians. A number of countries such as the UK, Australia, South Africa, Brazil, and Poland have had the problem of shortage of engineers; desperately short of 15,000 engineers in Germany, but also the employers' concerns about the engineering and technical graduates declined year by year. In China, with the internationalization of innovative engineering and technical talent is reflected out of the great competitiveness to attract all types of enterprises competing to “buy”. Internationalization of innovative engineering and technical talent refers both to the tip of the pyramid of senior professionals, but also has made achievements in the field of engineering science and technology at all levels and types of engineering and technical personnel [2,3]; that they could make a significant innovation in a particular area, you can also make a targeted piecemeal reform. To this end, the “National Long-term Scientific and Technological

Development Plan” put forward that total R&D investment would account for 2.5% of GDP in 2010, the contribution rate of science and technology would be increased by more than 60%, and the target of reducing dependence on foreign technology would be less than 30%. Independent colleges are organized by the regular undergraduate institutions according to the new mechanism, the new model at undergraduate level, with the nature of popularization to help application - oriented undergraduate education in educational institutions [4-7]. Based on the traditional evaluation method of natural science curriculum assessment and under the background of the context of culture-oriented engineering and technical personnel, there are many inappropriate places, which are not conducive to the cultivation of engineering and technical personnel. Therefore, in the rapid development of industrialization, informatization and urbanization, it is particularly necessary and urgent to explore the independent curriculum reform for engineer certification in Colleges and universities.

II. THE BASIC QUALITY OF THE INNOVATIVE ENGINEER

The abilities to apply innovative engineers include not only the natural sciences, but also the knowledge and ability to propose methods, broad technology-based, professional and technical breakthroughs to solve an obvious problem [8-10]. Therefore, the key features of the innovative engineers need not only the analytical ability, practical ability, creativity, communication skills, but also business and management skills, ethics and lifelong learning ability. As to China, we also need to cross the comprehensive ability of theory and practice and multi-disciplinary knowledge.

III. TRAINING OF INNOVATIVE ENGINEERS

Innovative engineers as the backbone of Industrialization, informatization and the process of urbanization, all countries are actively exploring the training mode of innovative engineers. In western countries, the widespread use of the technology model, technical positions targeted training; this mode is well

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training purposes, for the three different types of requirements respectively; but if we just stick on the respective modules, it will limit our horizons, sometimes leading to solve the problem not by the best way. Therefore, we should not only encourage to learn from each other between the three types of modules, cross-exchange to produce new modules for the specific needs of the community, and encourage exchanges between the platform and the module, to the needs of the community module, reverse enhance the platform. The eventual realization: platforms to best meet the needs of the module, the module to best meet the needs of the community.

D. The Growth of Innovative Engineers

The growth of innovative engineers have long-term and team characteristics, therefore, in the training process, the concept of lifelong learning should be running through them, to develop students' self-learning ability; in addition, to develop students' teamwork thinking through the quality of development and the establishment of the task force. This requires us to focus on course systematic, scalability in the teaching process, so that students can along a direction of the subject, do lasting learning and research. In addition, we should encourage the working engineer innovation ability retraining, this is a manifestation of life-long learning, and also is an effective way of practicing engineers to open up horizons of knowledge. The project teams are organizational forms widely used in the modern enterprise management, this way to combine traditional teaching that is chaired by the instructor in teaching and learning by the students under the guidance of autonomous and independent discussion, in order to improve the students' sense of teamwork.

IV. SUMMARY

Innovative engineers as the backbone of the modernization, and its training has become one of the important components of the national long-term talent strategy. The rapid development of this stage of

industrialization, innovative engineer training is both an opportunity and a challenge. As universities, especially the application of institutions, it should first study the social demand for qualified personnel, and timely adjustment of the course structure, combined with the characteristics of innovative engineers, individualized, to apply what they have learned to achieve seamless cultivating and social needs.

REFERENCES

- [1] Bruning M.J., Rover D.T., Williams A.M. Work in progress—Developing engineers for 2020—An innovative curricular and co-curricular approach [C] // *Frontiers in Education Conference (FIE)*, 2011. IEEE, 2011: S4D-1-S4D-3.
- [2] Liu Y. Research on innovative excellent engineers cultivation [C] // *Computer Science and Education (ICCSE)*, 2010 5th International Conference on. IEEE, 2010: 809-811.
- [3] Sheppard S., Macatangay K., Colby A., et al. *Educating engineers: Designing for the future of the field* [M]. San Francisco, CA: Jossey-Bass, 2009.
- [4] Cortes I., Montes M.V., Quiñones R., et al. Design of an Innovative Learning Experience for the Final Project of the Building Engineering Degree [J]. *INTED 2012 Proceedings*, 2012: 4280-4290.
- [5] Mathew A., Pangracious V., Varghese A., et al. PROJECT HAWK: An innovative introduction of practical learning and entrepreneurship in engineering education [C] // *Interdisciplinary Engineering Design Education Conference*. IEEE, 2012.
- [6] Edwards-Schachter, Mónica, García-Granero, Ana, Sánchez-Barrioluengo, Mabel, et al. Disentangling competences: Interrelationships on creativity, innovation and entrepreneurship[J]. *Thinking Skills and Creativity*, 2015, 16: 27-39.
- [7] E2020 Scholars Program, College of Engineering, Iowa State University, URL: <http://www.eng.iastate.edu/e2020/>, 2010.
- [8] Mohannak K., Javanmardi Kashan A.. The role of knowledge integration in innovation and capability development [J]. 2015.
- [9] Kota M. A Proposed Strategy for Using the Time-Management Approach in Developing University Leaders' Performance in the Light of Quality Standards (A Future Study) [J]. *Journal of Technology Management & Innovation*, 2014, 10 (1): 70-82.
- [10] Pontius, J., R. Cooper, C. Rumann, "E2020 Student Scholar Survey", The Research Institute for Studies in Education, 2010.