

Exploration and Practice of Training Excellent Engineers through the Industry-education Integration under the Background of New Engineering

Yanfang Xing

School of Communication Technology, Communication University of China, Nanjing, 211172, Nanjing Jiangsu, China

ABSTRACT

Under the background of new engineering, global industrial structure adjustment and technological innovation have put forward higher requirements for the quality and ability of engineering talents, so the needs for training excellent engineers is more urgent. However, the research shows that there are some problems in the current training system of excellent engineers, such as low matching degree between course content and industry demand, lagging construction of practice platforms and insufficient depth of school-enterprise cooperation. In order to effectively cope with these challenges, colleges and universities must optimize curriculum design to adapt to the trend of technology development, jointly build practical education platforms to enhance engineering practice ability, and deepen the school-enterprise cooperation mechanism to enhance the collaborative education efficiency. The in-depth exploration of the mode of industry-education integration in colleges and universities will improve the practical and innovative abilities of engineering talents, and better meet the urgent demand of society for high-quality engineering talents, so as to promote the virtuous cycle of industry development and technology.

KEYWORDS

new engineering; excellent engineer; integration of industry and education; school-enterprise cooperation

As a development concept of higher engineering education in response to the new round of technology revolution and industrial transformation, new engineering aims to keep up with social needs and industrial evolution trends to cultivate high-quality engineering talents with innovative thinking, practical ability and global vision. It pays attention to the deep integration of disciplines, and advocates the close connection between engineering education and industrial reality, so as to break the limitations of traditional teaching modes. Through the deep integration of industry and education and the collaborative education mechanism, new engineering can promote engineering education from a closed and theory-oriented model to a more open and practice-centered model, and comprehensively improve the quality of talent training. In this regard, this paper explores the specific training path of excellent engineers through the industry-education integration under the background of new engineering.

1 The Necessity of Training Excellent Engineers through the Industry-education Integration under the New Engineering Background

1.1 Meet the Urgent Need of Society for High-quality Engineering Talents

Under the background of new engineering, the rapid development of global technology and the profound changes of industry make the society urgently need high-quality engineering talents. However, the traditional engineering education model is backward, and there is a long separation between theory and practice, which cannot meet the urgent demand of society for high-quality technical talents. By integrating the high-quality resources of universities and enterprises, the integration of industry and education can make the course content close to the actual needs of the industry, and focus on cultivating the ability to solve complex engineering problems and the practical capability of students, so as to strengthen students' professional abilities and adaptability to employment, and make them become an important engine driving industrial upgrading and technological innovation in the tide of high-quality economic development, thus meeting the needs of society for talents.

1.2 Adapt to the Development Trend of Industrial Structure Adjustment and rapid Technological Iteration

Under the background of new engineering, the training of excellent engineers through the integration of industry and education is conducive to quickly meet the multiple needs of technological change and industrial structure adjustment. With the continuous emergence of new technologies and new industries, the knowledge update in the field of engineering technology presents an exponential growth, and the traditional education model is difficult to train talents who can adapt to such rapid changes due to its hysteresis^[1]. However, based on the integration of industry and education, colleges and universities can cooperate with enterprises to develop the curriculum system and practical projects at the forefront of the industry, so that the teaching content can flexibly respond to the dynamic evolution of

technology and industry, give excellent engineers the ability to quickly adapt to industrial practice, and make them easily adapt to the technology iteration and industrial upgrading, thus injecting innovative momentum into the development of emerging industries.

1.3 Promote the Transformation and Innovation of Teaching Modes in Higher Education

The training of excellent engineers based on the integration of industry and education in the new engineering background closely matches the deep needs of society and industry, and promotes the transformation of traditional theory-oriented teaching mode in higher education to the practice and innovation-driven mode. In the traditional higher education, the single training path centered on the discipline can no longer adapt to the increasingly complex environment in the new engineering background, but the integration of industry and education combines the interdisciplinary and industrial needs, and creates a diverse and open learning environment for students. Under this model, the course design, teaching methods and practical links realize a comprehensive innovation, which stimulates the motivation and innovation potential of students in independent learning, which significantly improves the overall level of engineering education in colleges and universities, and can help students inject sustainable innovation vitality and competitiveness into social and economic development in the new era.

2 Current Training Status of Excellent Engineers

2.1 The Matching Degree between Curriculum Content and Industry Demand is Insufficient

In the training of excellent engineers, the disconnection between the curriculum content and the actual industry demand is particularly prominent. Many colleges and universities still follow the traditional engineering education concept, and emphasize the systematic teaching of theoretical knowledge, so they fail to timely capture the dynamic characteristics of the rapid development of industrial technology, and cannot to meet the realistic needs of knowledge renewal.

The linkage between the frontier of industrial technology and the teaching content in colleges and universities is obviously insufficient, and the curriculum system is lagging behind in reflecting the development trend of emerging industries and technical requirements, which directly leads to the insufficient ability of students to face complex engineering problems and the lack of seamless adaptability to the industrial environment, thus hampering the realization of the goal of training excellent engineers.

2.2 Practice platform Construction is Relatively Lagging Behind

The cultivation of excellent engineers cannot be separated from the cultivation of engineering practice ability, and the perfect practical education platform is the cornerstone of the development of this ability. But at present, the construction of practice platform in colleges and universities is generally lagging behind, which is manifested as old experimental equipment, scarce engineering practice opportunities and lack of systematic practice teaching systems. At the same time, the separation between the practical resources in colleges and universities and the advanced technology in enterprises further aggravates the dilemma of the improvement of students' practical ability, and makes it difficult for students to obtain real engineering project experience during the school period, thus hindering the cultivation of students' engineering ability, and directly weakening the quality and social value of the training of excellent engineers.

2.3 There is a Lack of the Deep Participation of School-enterprise Collaborative Education Mechanism

As an important way to train excellent engineers, school-enterprise collaborative education has been widely recognized in concept, but in practice, it is often difficult to achieve the expected effect because of lack of depth. The current school-enterprise cooperation mostly stays at the formalized level. Although the common short-term internship, enterprise lecture and other activities provide opportunities for students to get in touch with the industry, due to the lack of systematic planning and continuous support, it is difficult to truly realize the in-depth transformation of knowledge and skills^[2].

In addition, the degree of involvement of enterprises in curriculum design, teaching implementation and student assessment is generally insufficient, which makes the mode of collaborative education lack the internal driving force and substantive effect. This kind of superficial cooperation weakens the practical orientation of engineering education and makes it difficult for the training quality of excellent engineers to meet the high-end needs of the industry, thus becoming a bottleneck restricting the development of new engineering.

3 The Strategy of Training Excellent Engineers through the Integration of Industry and Education under the Background of New Engineering

Under the background of new engineering, the training of excellent engineers through the integration of industry and education should be started from the aspects of optimizing the course content, establishing the practical education sharing platform of school-enterprise cooperation and perfecting the long-term mechanism of school-enterprise collaborative education.

3.1 Optimize the Course Content to Meet the Core Needs of the Industry

Under the background of new engineering, the cultivation of excellent engineers through the integration of industry and education needs to start from the deep optimization of course content to accurately meet the core needs of the industry. Universities and leading enterprises should jointly set up curriculum development committees to dynamically track technological trends and ensure that curriculum design is always in line with industrial development. At the same time, cutting-edge technologies, industry standards and typical engineering cases should be integrated into the curriculum to improve students' ability to solve practical engineering problems.

The combination of theory and practice affects the depth and breadth of students' mastery of knowledge. Therefore, teachers should shift the teaching from the traditional mode to project-centered dynamic learning. In the course content, emphasis should be placed on the embedding of practical links, and theoretical knowledge should be integrated into specific engineering tasks, so as to realize the two-way strengthening of knowledge and skills^[3]. At the same time, interdisciplinary elective courses should be introduced to further broaden boundaries of students' horizons and competence, and help them build a knowledge system to cope with complex challenges. The rich course content can effectively train compound engineering talents with both innovative and practical abilities.

3.2 Build a Practical Education Sharing Platform of School-enterprise Cooperation

The practical education sharing platform of school-enterprise cooperation is an important way to train excellent engineers through the integration of industry and education under the new engineering background. Colleges and universities should invest resources jointly with enterprises to build sharing laboratories and training bases to effectively make up for the shortage of practical teaching resources in colleges and universities. These sharing platforms should rely on the advanced equipment and real production environment in enterprises to help students complete engineering practice training in the conditions close to the reality. The schools and enterprises should clarify the cooperation agreement to regulate the specific responsibilities of both parties in resource allocation, platform use and operation management to ensure the long-term and efficient operation of the platform.

The practical education sharing platform should provide a variety of practical projects to meet the growth needs of students at different stages. Enterprises can propose specific production problems or technical needs, and students and enterprise engineers can form cross-border teams to solve them together. In this process, students can deeply participate in the whole cycle management of the project, from the definition of the problem to the implementation of the solution, so that they can accumulate practical experience, and have a deep understanding of the technical operation logic and industrial laws of the enterprise.

Improving the guidance mechanism is an important support for the sustainable development of the platform. As practice tutors, enterprise technicians should cooperate with university teachers to regularly organize equipment operation training, engineering case explanation and problem solving seminars to help students quickly master key skills required for engineering practice^[4]. Colleges and universities should also introduce a digital management system to further improve the operational efficiency of the platform, and monitor students' learning progress and ability improvement through data analysis to form a quantitative evaluation system for practical activities, thus providing accurate basis for subsequent optimization and construction.

In addition, the sharing platform should be open, such as holding regional or industrial engineering innovation competitions, in order to attract more universities and enterprises to participate. It expands the practical platform for students, promotes the deep integration between schools and enterprises, and makes the model of collaborative education of industry and education more mature, thus helping to promote the continuous deepening of the reform of new engineering.

3.3 Deepen School-enterprise Cooperation and Improve the Long-term Mechanism of Collaborative Education

Deepening school-enterprise cooperation and building a sound long-term mechanism of collaborative education is a

major strategy for training excellent engineers through the integration of industry and education in new engineering. Universities and enterprises should reach an agreement on the overall plan. From the goal of talent training to the implementation path, and to the specific division of responsibilities, all need to be clear in the form of cooperation agreements. The planning should not only define the deep participation of enterprises in course design, practice resource provision and professional quality training, but also emphasize the responsibility and obligation in the collaborative process, so that the two sides can form stable cooperation under the common goal.

In order to promote collaborative education, it is necessary to take the school-enterprise joint management organization as the center of implementation and coordination. The agency is tasked with coordinating resources, assessing progress, and solving problems. It can invite enterprise executives and technical experts to serve as adjunct professors or course consultants to further expand the knowledge transfer channels of school-enterprise cooperation. At the same time, activities such as special lectures, technology sharing meetings and career development guidance should be organized to bring students direct experience in line with the industry^[5].

The multidimensional evaluation system is an important tool to measure the effect of collaborative education. Schools and enterprises should combine the needs of enterprises with the goals of colleges and universities, and integrate many contents such as knowledge mastery, skill improvement and professional quality training into the evaluation system. The evaluation system should be based on the multiple feedback of enterprise tutors, college teachers and students' self-reflection, and dynamically record the growth track of students' ability. The evaluation system provides operational data support for mechanism optimization, and can improve the sensitivity of collaborative education to industrial needs.

Government policies and financial support are important to ensure the stability of cooperation. The government should set up a special fund to support and reward universities and enterprises that have outstanding performance in collaborative education, so as to encourage more enterprises to incorporate school-enterprise cooperation into their strategic development plans. At the same time, excellent cooperation cases and models should be promoted to provide reference for the training of excellent engineers under the background of new engineering.

4 Conclusion

Under the background of new engineering, the training of excellent engineers through the integration of industry and education has become the direction of engineering education reform and an important way to meet the supply and demand of high-quality engineering talents. Colleges and universities should cooperate with enterprises to optimize the design of course content, systematize the construction of practice platform, and deepen the school-enterprise collaborative education mechanism, so as to significantly improve the core competitiveness of excellent engineers in professional quality and practical ability. Looking forward to the future, colleges and universities need to continue to strengthen cooperation with enterprises, build a long-term training system for sustainable development, and promote engineering education to dynamically adapt to the needs of industrial change, so as to provide more high-level and adaptable engineering talents for the society.

Funding

Communication University of China, Nanjing School-level Education Reform Project in 2023, Exploration and Practice on Cultivating New Engineering Outstanding Engineers of Industry-education Integration in Media Major (Subject No: JG202305).

About the Author

Yanfang Xing, Master, Associate Professor, Research Fields: Embedded System, Artificial Intelligence.

References

- [1] Shen Yu, Yang Xiaojiao. Research on the Practice Model of Training New Engineering Talents from the Perspective of the Evolution of Integration of Industry and Education [J]. China University Science & Technology, 2024(10):51-55.
- [2] Ren Youqiao. Research on the Collaborative Education Mechanism of the Integration and of Production and Education under the Background of New Engineering——Taking University of W as Example [D]. East China Normal University, 2022.
- [3] Liu Qing, Wang Yu, Fan Luhuan. Analysis of the Problems in Cultivating Excellent Engineers in China and Suggestions [J]. Journal of National Academy of Education Administration, 2024(5):44-52, 95.
- [4] Zhao Conghui. On the Education Model of Integration of Production and Education under the Background of New Engineering ——Taking Xidian University as an Example [D]. Xidian University, 2019.
- [5] Yuan Yijia, Xia Meng, Ji Hongjun, et al. Interdisciplinary Practice of Basic Curriculum for Training Excellent Engineers in New Engineering [J]. Journal of Higher Education, 2024, 10(20):13-16.