Research on the Construction of Data Science and Big Data Professional Curriculum System Based on Professional Certification Concept under the Background of New Engineering

Weiwei Guo[a], Feng Liu[b], Yingjie Song[c], Xiaomin Zhao[d], and Yu Sun[f]

Department of Electrical and Information Engineering Heilongjiang University of Technology Jixi, China

[a]gwwguoweiwei@163.com, [b]45421302@qq.com, [c]liufeng8038@163.com, [d]hljgyxylf@163.com, [f]42430634@qq.com

Keywords: New engineering; Engineering education certification; Curriculum system

Abstract: After the new engineering construction is put forward, new requirements are put forward for the training of talents in colleges and universities. Under the background of new engineering construction, the engineering education certification personnel training and curriculum system must be set up with engineering certification as the standard, and the training process should be based on engineering education professional certification standards. The foundation should not only highlight the requirements of new engineering construction, but also cultivate high-quality engineering talents with an international vision and enhance the adaptability of data science and big data technology professionals to local economic and social development. They should combine the needs of local regional economy, society and industry development, build a student-oriented curriculum system, highlight the training of engineering certification competence, clarify the key points of the data science and big data technology curriculum system, gradually develop school-enterprise cooperation and teachers team building, and explore the establishment of an engineering education professional certification system that is linked with the engineer system, so as to continuously improve the quality of talent cultivation, improve the fit of big data professions with industry and enterprises, and effectively guarantee the quality of students' employment.

1. Introduction

The assessment process of engineering education professional certification is to evaluate the school running situation and teaching quality through the social third-party strength, and to measure the overall situation of college graduates entering the society to meet the social needs. The third-party evaluation is more scientific. The evaluation of talent training in schools has become a hot issue in most universities in China. Since the introduction of the “Fudan Consensus”, “Tianda Action” and “Beijing Guide” in 2017, it has pointed out the direction for the development of new engineering in China. Data science and big data technology are one of the most popular majors. How to develop talents and make students and enterprises highly compatible is the problem that has been studied at present based on the concept of professional certification in the new engineering background. As a local undergraduate college, Heilongjiang Institute of Technology, under the background of new engineering, builds a curriculum system with rich content, diverse forms and open sharing according to the standards and requirements of engineering education professional certification, and perfects teaching methods and applications based on practical projects. The undergraduate course system construction ideas and the student ability evaluation mechanism. Establish an engineering education professional certification system that is linked with the engineer system, highlight the requirements of new engineering construction, strengthen the cultivation of students' professional ability and quality, closely combine local economic and social and industrial development needs, and cultivate a group of innovative and practical abilities. The application of high-level professional technical talents, constantly promote the reform of new engineering education in local colleges and universities, improve the quality of personnel training, professional

  DOI: 10.25236/icemc.2019.017

influence, social recognition and visibility [1].

2. A Review of Engineering Education Certification under the Background of New Engineering

2.1 A Brief Description of the Research Status at Home and Abroad.

In foreign countries, engineering education certification has been developed for a long time, and a relatively complete authentication mechanism has gradually formed in the development. In 1932, the United States established the Engineering and Technology Education Accreditation Committee, which was also the earliest country for the establishment of a professional certification system. In the 1960s, the United Kingdom began to establish professional certification, and established an engineering committee responsible for engineering education certification. The “Washington Accord” professional certification has been determined to be international. The new engineering construction has the characteristics of China and the locality of the colleges and universities. Therefore, the curriculum system based on the new engineering has both international equivalent, goal orientation, ability orientation, and The characteristics of continuous improvement, but also have local characteristics suitable for the cultivation of students' ability [2].

In China, the engineering education professional certification work has just started in 2006. After 7 years of work, in 2013, it became a preparatory member of the Washington Agreement and became a full member in 2016. Professor Zhang Xuehong and others have discussed the content of undergraduate teaching reform in engineering under the background of engineering education certification system [3];Prof. Fang Wei made a full analysis of how to carry out professional certification in China and how to integrate with the international community [4]; Wang Ling and others have demonstrated and analyzed the characteristics of engineering education certification; the development of new engineering is beneficial to local colleges and universities in China. Quasi-positioning, determining the goals of running a school, and highlighting the characteristics of running a school, in the transformation process of new engineering construction, the original school-running traditions and the foundation of running a school in many local universities will have constraints on engineering education reform [5].

2.2 The Concept and Characteristics of Engineering Education Certification under the Background of New Engineering.

“Student-oriented” is the core concept of engineering education certification. “Result-oriented” emphasizes student-centered, teacher-directed, student-led, knowledge integration, cooperative learning and achievement evaluation. The services provided in professional settings must be It is carried out with students as the center. To determine the professional training objectives must be combined with the basic situation of the profession, at the same time be scientific and reasonable, integrate the existing professional training programs, curriculum systems, teaching content, practice links, etc., in the professional construction, teaching links, the training of the teaching staff, The curriculum assessment mechanism and other aspects of the new planning and construction, the combination of theoretical and practical teaching, strengthen the ability of students, combined with regional characteristics to cultivate students' innovative ability, form a new development model of local engineering specialty characteristics, while training talents To serve the development of local areas and society. The role of local universities in new engineering should be determined to serve the localities, cultivate engineering and applied talents, and carry out technological R&D and innovation for the industry [6].

3. Constructing a Curriculum System Based on Engineering Education Certification under the Background of New Engineering

The construction of the curriculum system should be combined with professional certification standards and new engineering construction, based on the local undergraduate applied undergraduate

colleges, analyze the professional positioning, personnel training objectives, and clarify the sequence of the various courses in the curriculum system. The requirements of capacity development, so as to organize the types of courses, form a reasonable and appropriate proportional relationship, develop a set of curriculum system that is perfect and reasonable, in line with professional development, and suitable for students to learn. In accordance with the construction of the engineering education certification curriculum system and teaching content, combined with the school's school-running characteristics, explore the engineering and application-oriented education platform model for data science and big data professionals training [7].

3.1 Curriculum System Construction Goals.

The new engineering science of data science and big data aims to focus on three levels of training. The first level is the training of computational thinking and Internet thinking. The second level is software system thinking and engineering thinking training. The third level is engineering. Eclectic training for rigorous, non-standardized solutions. The balance between the basic knowledge teaching and the compound knowledge teaching in this subject, cultivate students' thinking ability to analyze problems and solve problems, cultivate students' thinking ability of communication, communication and cooperation, and cultivate students' ability to actively learn and develop them. The habit of lifelong learning, enhance the employment competitiveness and the cultivation of innovation and entrepreneurial initiative. Through the latest development of professional talent training programs and syllabus optimization and integration, reform and optimization of teaching content. Project innovation concept, innovation mode, innovative education mode, training the application-oriented talent training mode that meets the needs of engineering, and cultivating talents with comprehensive practical ability of engineering consciousness, engineering quality and engineering practice ability for the development of local colleges and universities, for the construction of new The engineering curriculum system services are prepared for professional certifications such as Big Data Analyst, CADA Data Analyst, Oracle OCA, OCP, and Alibaba Cloud (ACP). The data science and big data professional training system framework is shown in Fig1.

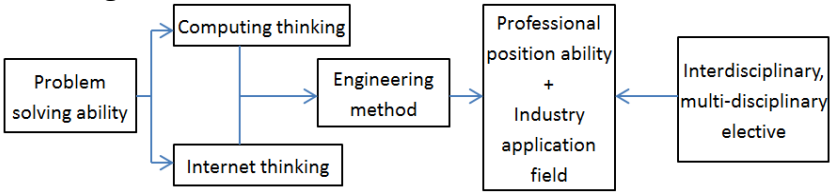

Fig. 1 Talent development system framework

3.2 Key Points in the Construction of the Curriculum System.

Strengthen professional ethics education in combination with professional certification. Through the establishment of relevant courses, combined with the cultivation of comprehensive practical ability, students are equipped with technical skills, human skills and conceptual skills, with good professional ethics, reflecting the responsibility for occupation, society and the environment [8].

Revise the talent training program and optimize the curriculum system. Optimize the course structure, ensure the proportion of practice courses; increase the proportion of elective courses, and increase inter-disciplinary and interdisciplinary elective courses. While proficiency in this major, increase the versatility and cross-cutting of various basic courses, and set up in-depth and simple Increase the elective course of knowledge; condense the core curriculum content, highlight key points, and highlight social needs.

Reform the teaching content and strengthen the curriculum construction. In accordance with the engineering education certification standards and the requirements of new engineering construction, the curriculum content of the curriculum will be reformed, and the comprehensive quality and creative thinking of students will be emphasized, and the interdisciplinary integration will be emphasized. Increase the content of the practical curriculum, the cooperative enterprise integrates

into the curriculum teaching, combines the project case of the enterprise, and expands the thinking of students' learning; through the case introduction, MOOC teaching, flipping classroom, UMU, rain classroom and other platforms to carry out online course teaching.

Changes in assessment content and methods. Higher engineering education based on new engineering construction should abandon the traditional education model, explore the establishment of a student-centered, results-oriented, continuous improvement of the examination system and methods, integrate the enterprise management and assessment system into the school's teaching management, so that students Learning can meet industry standards. The assessment process is no longer a separate task for school teachers. The enterprise will also undertake most of the assessment work. After the enterprise's assessment is passed, it can not only meet the needs of the job, but also make the passive learning of students become active learning and the knowledge of books. Become a task of the job, actively cultivate students' engineering awareness, collaborative spirit and the ability to comprehensively apply what they have learned to solve practical problems, and also pay attention to the cultivation of students' teamwork ability.

The second class. In the teaching process, students are encouraged to participate in the college's innovation laboratory, the teacher's research institute, the participating teachers' research projects, and participate in various competitions, such as the National Blue Bridge Cup Programming Contest, the National Computer Contest, the ACM Contest, etc. Classroom, guiding students to learn is the process of solving practical problems, and is the process of cultivating thinking ability.

3.3 Establish a School-Enterprise Cooperation Guarantee Mechanism.

Enterprises have recognized a crucial role in engineering education. Schools must establish long-term and win-win development cooperation mechanisms with enterprises. Schools should rely on some preferential policies of local governments to attract some enterprises to settle down, establish an in-depth cooperation model with local universities, and promote the development of big data industry in the region and promote the upgrading and transformation of other industries. At the same time, the school and the local government take the lead, with big data + green agriculture, big data + medicine, big data + coal, big data + smart city as the entry point to solve the real problem of shortage of professional talents in the regional big data industry, explore school and school, The in-depth integration and long-term development mechanism of multi-party cooperation and multi-party win-win cooperation, which has become an inevitable trend of talent training under the background of new engineering [9].

3.4 Promote the Construction of the Teaching Staff.

The construction of the teaching staff is an important part of the professional certification of engineering education. It requires the teaching staff to have strong teaching ability, professional level, engineering experience and research on engineering practice issues. The construction of a team of teachers with high quality, reasonable structure and sufficient staff can only effectively meet the training of engineering talents. Therefore, on this basis, new standards are put forward for the requirements of college talents. At the same time, colleges and universities are required to introduce a series of talent development strategies. Starting from the training of teachers, career development and engineering standards, we will gradually explore the data science of local universities. The problems related to the construction of a large-data professional faculty team and the pace of building a high-quality faculty team [10].

4. Conclusion

Under the background of new engineering, the curriculum system of new engineering talents innovation and entrepreneurship training mode of data science and big data technology, adhere to the reform and practice of new engineering in local universities, combined with the characteristics of school education and actual basic conditions, through the pilot courses of typical cases. Construction, continuous innovation and improvement in the construction process, so as to build a scientific, rational and standardized new engineering innovation and entrepreneurship education talent training

model. The innovations that need to be formed in the process of reform can be mainly reflected in the following three aspects:

First, based on the "Washington Accord" professional certification and the new engineering construction unified perspective, the local colleges and universities to carry out the personnel training model and curriculum system reconstruction.

Second, innovative teaching management, curriculum organization, matching methods of various resources; establishing a teaching content update mechanism, combining market and industry needs, continuous improvement and updating; combining local college professional talent training programs to propose talent training links New ideas and concepts, the process of identifying talent training programs and curriculum systems should be integrated into the experts of enterprises and industries, thus improving the social needs of personnel training.

Thirdly, for the professional investigation, the investigation of the level of employment students, employers' enterprises and units, through this method of integration, fully developed the curriculum system and the employment unit or employer and the market demand is the most consistent Achieving a degree-matched curriculum system.

As the new engineering and engineering education professional certifications are new things, we have no experience in the certification of data science and big data. Data science and big data technology are also the newly established majors in our school, and the theoretical teaching in the engineering education certification course system. There are still some shortcomings in practical teaching and school-enterprise cooperation and training. To this end, we will continue to reform and innovate training methods and means in accordance with professional certification standards, strengthen the management of engineering practice teaching links and school-enterprise cooperation training methods, and constantly improve the teaching quality monitoring system and curriculum evaluation system, thereby improving the quality of personnel training, Serve local and service areas for economic and social development to train talents with comprehensive practical ability in engineering awareness, engineering quality and engineering practice ability.

Acknowledgment

This work was supported by the Heilongjiang Provincial Education Science Planning Project “Research on the Construction of New Engineering Curriculum System for Applied Undergraduate Colleges under the Professional Certification Concept—Taking Data Science and Big Data as an Example” (GJC1318091).

References

[1] He Wenwu. Research on the Construction of a New Community of Educational Community and Learning Community——Taking Data Science and Big Data Technology as Examples[J]. Educational Review, 2018(8): 46-51.

[2] Fang Zheng. The Road to Internationalization of China's Engineering Education Accreditation——Becoming a Prepared Member of the Washington Accord[J]. Higher Education Research, 2013(6): 72-76.

[3] Zhang Xuehong, Wang Wen, Xu Jianping. Countermeasures for the Reform of Higher Engineering Education in the New Period[J]. Higher Education Research, 2012(3): 53-56.K. Elissa, “Title of paper if known,” unpublished.

[4] Zhang Xuehong, Zhang Jun, Zeng Hongwei. Enlightenment of undergraduate teaching reform of environmental engineering under the background of engineering education certification system[J]. University Teaching in China, 2011(6):37-39.

[5] Fang Zheng. Comparison of Engineering Education Certification System for Signing Members of the Washington Agreement[J]. Higher Education Development and Evaluation, 2014(4): 66-76.

[6] Tang Xiaoyong. Construction of Big Data Technology Curriculum System in Local Universities

under the Background of New Engineering[J]. Computer Knowledge and Technology, 2018(2): 122-123.

[7] Gui Jinsong, Zhang Zuping, Guo Kehua. Exploration and Practice of New Professional Construction in Colleges and Universities under the Background of New Engineering Science——Taking Data Science and Big Data Technology as an Example[J]. Computer Education, 2018, No.283(07):31-35 .

[8] Zhang Zhiwei, Fang Aidong, Cui Lin, et al. Exploration of Big Data Major Construction under the Background of New Engineering[J]. Journal of Panzhihua University, 2018, 35(05): 113-117.

[9] Tan Hongye, Li Ru, Lu Guoying. Construction of Computer Science and Technology Talents Training Model Based on Data Science and Engineering Characteristics[J]. Computer Education, 2018.

[10] Cao Wei, Zhang Jianming, Zhou Shuren, et al. Discussion and Practice of Computer Science and Technology Talents Training Mode Based on Professional Certification[J]. China Modern Educational Equipment, 2016(1): 47-49.