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Discussion on the Reform of Teaching Organization in Universities under the Background of Engineering Education Certification

Guoyuan Lin*, Yonggang Li, Yu Bao

School of Computer Science, China University of Mining and Technology Xuzhou 221000, Jiangsu Province, China

Corresponding author: Guoyuan Lin, lingy@cumt.edu.cn

Abstract: Engineering education certification is a comprehensive evaluation of educational institutions, curriculum settings and teaching quality, which plays a very important role in engineering education. The grassroots teaching organization is the main body and cornerstone of the implementation of education. The construction of the grassroots teaching organization suitable for engineering education certification is the inevitable requirement of engineering education. This article analyzes the requirements of engineering education certification for grassroots teaching organizations, points out the existing problems in grassroots teaching organizations, and further proposes ways to reform grassroots teaching organizations.

Keywords: Engineering education certification; Grassroots teaching organization; Reform way

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1. Introduction

Engineering education plays an important role in economic development. Engineering disciplines cover a wide range of fields, from infrastructure construction to high-end manufacturing, from energy development to information and communication, all of which are important pillars for the economic development.

Engineering education certification, as an important means to improve the quality of engineering education [1] helps in promoting the reform and development of engineering education, and enhance the international competitiveness of engineering education, which has become increasingly important [2–4]. In 2016, China officially became the 18th member country of the Washington Agreement, which marks that the quality of China's undergraduate engineering education has reached the recognition of international certification standards and realized the substantial equivalence of international mutual recognition quality standards. By the end of 2022, a total of 321 institutions of higher learning in China had certified 2,385 majors, covering 24

engineering majors [5].

In the process of promoting and implementing engineering education, grassroots teaching organizations in colleges and universities are the main force [6–8]. They are responsible for key links such as specific curriculum setting, teaching plan formulation, textbook selection and teaching implementation to ensure the professionalism and systematic of engineering education [9–10]. Through careful organization of teaching activities, grassroots teaching organizations can provide students with comprehensive and in-depth opportunities to learn and practice engineering knowledge, help them master solid basic engineering theories and skills, and promote the achievement of training goals [11]. In addition, grassroots teaching organizations in colleges and universities are an important driving force for the reform and innovation of engineering education [12–13]. In the face of rapidly changing engineering fields and constantly updated technical requirements, grassroots teaching organizations should be able to grasp the pulse of this era [14], adjust teaching content and methods accordingly, and promote the reform and innovation of engineering education [15].

2. Requirements of engineering education certification for grassroots teaching organizations in colleges and universities

(1) In terms of teaching concepts and objectives, grassroots teaching organizations need to establish teaching concepts that are consistent with engineering education certification, emphasizing student-centered, output-oriented and continuous improvement. This means that grassroots teaching organizations need to pay attention to the overall development of students, and pay attention to cultivating students' practical ability, innovative spirit and teamwork ability. At the same time, grassroots teaching organizations also need to clarify training goals according to certification requirements to ensure that the students they cultivate can meet the needs of the industry and social expectations.

(2) In terms of course setting and teaching content, grassroots teaching organizations need to optimize the course structure and update the teaching content according to the certification standards and industry needs. Grassroots teaching organizations need to pay attention to the latest developments and technological changes in the field of engineering, integrate cutting-edge knowledge into the curriculum, and ensure the advancement and practicability of the curriculum. In addition, grassroots teaching organizations also need to pay attention to the combination of theory and practice, increase practical teaching links and improve students' practical ability.

(3) In the construction of teaching staff, grassroots teaching organizations need to strengthen the construction of teaching staff, improve the teaching level and professional ability of teachers. Grassroots teaching organizations need to introduce and train teachers with engineering background and rich teaching experience, encourage teachers to participate in engineering practice and research activities, and improve teachers' practical ability and innovative spirit. At the same time, grassroots teaching organizations also need to strengthen the training and assessment of teachers to ensure that teachers can meet the requirements of engineering education certification.

(4) In terms of the guarantee of teaching conditions and resources, the grassroots teaching organizations need to improve the teaching conditions and provide sufficient teaching resources. This includes the construction of advanced laboratories, practice bases and other practical teaching facilities to provide students with a good practice environment. In addition, grassroots teaching organizations also need to strengthen cooperation with enterprises and industries, strive for more external resource support, and improve the quality and effect of practical teaching.

(5) In terms of teaching management and quality control, grassroots teaching organizations need to establish a perfect teaching management and quality control system. This includes formulating scientific teaching management systems and norms, strengthening the monitoring and evaluation of the teaching process, so as to continuously improve teaching quality of learning. At the same time, grassroots teaching organizations also need to establish an effective feedback mechanism to collect and deal with the opinions and suggestions of students, teachers and society on teaching in a timely manner, so as to provide strong support for teaching improvement.

3. Current problems faced by grassroots teaching organizations in colleges and universities

(1) The grassroots teaching organizations do not know enough about the importance of engineering education

In terms of teaching ideas and objectives, the grassroots teaching organizations often pay too much attention to the traditional knowledge transfer and theoretical teaching, but neglect the practicality and innovation of engineering education. They may not fully understand the concepts of engineering education certification, leading to a disconnect between teaching goals and industry needs and social expectations.

Grassroots teaching organizations may lack awareness of alignment with engineering education accreditation standards. They may fail to adjust and optimize the course structure according to the certification requirements and industry needs, resulting in an outdated curriculum system and slow content update that cannot meet the professional and cutting-edge requirements of engineering education.

(2) Grassroots teaching organizations often do not pay enough attention to teachers' engineering background and practical experience

When introducing teachers, many colleges and universities pay more attention to their theoretical level and scientific research achievements but ignore their engineering background and practical experience. As a result, candidates with rich engineering backgrounds and practical experience are underestimated. They cannot be added to the teaching team, resulting in the overall quality and ability of the teaching team failing to meet the needs of engineering education.

Grassroots teaching organizations have relatively limited resources and may be unable to carry out adequate engineering training and development programs to help teachers upgrade their engineering background and practical experience. This may result in teachers lacking the necessary skills and knowledge when faced with practical problems.

(3) The basic teaching organization has the problems of unclear responsibilities, poor coordination between departments, and insufficient engineering practice conditions

In some colleges and universities, the boundary between teaching and research departments and course groups is blurred, resulting in frequent changes in the distribution of teaching tasks, and it is difficult for teachers to define their responsibilities clearly and cannot continuously invest in the same course. Frequent changes in the curriculum can bring additional work burdens to teachers. Teachers need to constantly adapt to new teaching contents and methods, which not only increases the difficulty of lesson preparation, but also may affect teachers' teaching enthusiasm and career satisfaction. Frequent changes to the curriculum can also have a negative impact on students. Students may have difficulty keeping up with changes in the curriculum, leading to a decrease in learning effectiveness. This situation not only affects the efficiency of teaching work but even

affects the quality of teaching.

Poor coordination of grassroots teaching organizations results in difficulty in integrating engineering practice resources and cannot effectively support students' engineering practice. For example, key resources such as laboratories, equipment, funds and instructors may not be properly allocated due to communication barriers between departments, resulting in inefficient use of resources or even idle. If the practical teaching resources cannot be effectively integrated, it results in insufficient resources and improper deployment. Students may not be able to carry out sufficient experimental operations, or can only carry out simplified practical projects, and the knowledge gained by students in theoretical study may not be verified and applied in practice. This situation will limit the scope and depth of students' practice, which will directly affect the quality of students' practice and even seriously affect the development of students' professional literacy and comprehensive ability.

4. Grassroots teaching organization reform under the background of engineering education certification

(1) Clarify the reform objectives, align the certification standards, optimize and build the organizational structure suitable for engineering certification

Grassroots teaching organizations should first clarify the goal of the reform, that is, to improve the quality of engineering education and cultivate high-quality talents who meet the certification standards and industry needs. This requires grassroots teaching organizations to deeply understand the connotations and requirements of certification standards and integrate them into daily teaching to ensure the achievement of teaching goals.

Combined with the requirements of engineering certification, it is important to carefully sort out the scope of responsibilities of grassroots teaching organizations, clarify the responsibilities of relevant departments and posts, avoid duplication and emission of work, and ensure the smooth progress of teaching work. It is necessary to establish a cross-departmental cooperation mechanism, strengthen the communication and cooperation between teaching and research departments, curriculum groups and other grassroots teaching organizations, form a joint force, and jointly promote teaching reform and teaching quality improvement. Following the requirements of the project, a special teaching research and reform center can also be established to be responsible for the planning, implementation and evaluation of teaching reform, promote teaching innovation and strengthen continuous improvement.

(2) Improve management systems, strengthen intelligent construction, and ensure the effective implementation of quality monitoring and evaluation mechanisms

The teaching organization can establish and improve the standard system of teaching management, clarify the requirements of teaching management, and ensure the standardization and institutionalization of teaching work. Besides, it can also establish a scientific incentive and restraint mechanism, reward individuals and teams with excellent teaching performance, and supervise and rectify poor teaching work.

The rapid development of information technology will have a profound impact on the reform of grassroots teaching organizations in colleges and universities. In the future, colleges and universities will rely more on information means, such as online education platforms, unified practice resource management platforms, intelligent teaching systems, etc., to optimize the teaching process and improve teaching efficiency. At the same time, the application of technologies such as artificial intelligence, big data and AI models will help grassroots teaching organizations in colleges and universities achieve personalized teaching and precise management to meet the diversified learning needs of students.

Grassroots teaching organizations should establish a scientific teaching quality monitoring and evaluation mechanism, and regularly evaluate and give feedback on teaching quality. Through the collection and analysis of teaching data, the problems and deficiencies in the teaching process are found, and adjustments and improvements are made accordingly. At the same time, the evaluation results should be used as an important basis for teachers' assessment and rewards to stimulate their teaching enthusiasm and enthusiasm.

(3) Deep integration of industry, university and research, optimization of the curriculum system, and strengthening practical teaching links

Grassroots teaching organizations in colleges and universities will pay more attention to the deep integration with the industry, and introduce and train teachers with engineering backgrounds and practical experience. Through school-enterprise cooperation and the integration of industry-university-research, courses, practical projects and teaching resources will be jointly developed to achieve positive interaction between education and industry. This will help improve students' practical ability and innovation ability, and cultivate more high-quality talents who meet the needs of the industry.

Grassroots teaching organizations should optimize and update the existing curriculum system according to certification standards and industry needs. On the one hand, outdated and repetitive curriculum content should be deleted, and cutting-edge and cross-cutting curriculum content should be added. On the other hand, educators should pay attention to the combination of theory and practice, add more practical links such as experiments and practical training, and continuously improve students' practical ability and innovative spirit.

Engineering education certification emphasizes students' practical ability and innovative spirit. Grassroots teaching organizations should improve the practical teaching system, increase the proportion of practical teaching and improve the quality of practical teaching. More practical opportunities and platforms can be provided for students by establishing practice bases inside and outside schools and carrying out school-enterprise cooperation.

5. Conclusion

The reform of grassroots teaching organizations under the background of engineering education certification is a systematic project, which needs to start from many aspects. By making clear the reform objectives, optimizing the curriculum system, strengthening the construction of teachers, improving the practical teaching system, establishing the teaching quality monitoring and evaluation mechanism, and promoting the implementation of information technology and other measures, the grassroots teaching organizations can continuously improve the teaching quality and level, and make greater contributions to the training of high-quality engineering talents.

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References

[1] International Engineering Alliance, 2021, Graduate Attributes and Professional Competence, viewed February 21, 2024, https://www.ieagreements.org/assets/Uploads/IEA_Graduate_Attributes_and_Professional_Competencies_2021.1_Sept_2021.pdf.

[2] Dai X, 2022, Further Understanding of the Certification Standards for Engineering Education Majors. Chinese University Teaching, 2022(11): 4–11.

[3] Wang G, Zhu L, Hu D, et al., 2022, International Comparative Study on Certification Standards for Engineering Education. Higher Engineering Education Research, 2022(2): 35–44.

[4] Zhu W, Chen Y, Li Y, 2023, New Trends in International Engineering Education Reform from the Perspective of GAPC Changes. Higher Education Development and Evaluation, 39(2): 40–49 + 120–121.

[5] China Engineering Education Certification Association, 2024, A List of Undergraduate Majors in Ordinary Higher Education Institutions That Have Passed Engineering Education Certification Over the Years, viewed June 28, 2024, https://www.ceeaa.org.cn/gcjyzyrzxh/xwdt/tzgg56/632172/index.html.

[6] Li Z, Dong L, Yu C, 2024, Research and Practice of Grassroots Teaching Organizations in Interdisciplinary Engineering Education. Research on Higher Engineering Education, 2024(1): 16–22.

[7] Li X, Zhang R, Yang R, et al., 2021, Construction of Quality Assurance System for Grassroots Teaching Organizations Under the Background of Professional Certification in the New Era. China Modern Educational Equipment, 2021(9): 69–71.

[8] Chen D, Wang L, Zhou C, et al., 2021, The Important Role of Grassroots Teaching Organizations in University Teaching Reform. University Education, 2021(1): 23–26.

[9] Ding Q, 2023, Analysis of the Construction and Management System of Grassroots Teaching Organizations in Universities: Review of "Construction and Management of Grassroots Teaching Organizations in Universities." Chinese Journal of Education, 2023(11): 111.

[10] Hong Z, 2020, The Reform and Development of Grassroots Teaching Organizations in Universities. Research on Educational Development, 40(19): 62–68.

[11] Wang X, Han J, Ma H, 2020, Reform and Development of Grassroots Teaching Organizations in Higher Education Institutions in the New Era. China University Teaching, 2020(10): 62–68.

[12] Zhao W, Ma H, Wu Q, 2020, Construction and Practice of Quality Monitoring System for Grassroots Teaching Organizations in Universities. Journal of Hangzhou University of Electronic Science and Technology (Social Science Edition), 16(4): 59–63.

[13] Li Z, Zhao W, 2021, The Latest Progress in Engineering Education Certification in China. Higher Engineering Education Research, 2021(5): 39–43.

[14] Yu Y, Lou Y, Yin X, et al., 2023, Research on the Reconstruction and Practice of Primary-Level Teaching Organization System in Colleges and Universities Under the Background of Integration of Science and Education. Frontiers in Educational Research, 2023(6): 63–69.

[15] Qu K, Li J, Liang X, et al., 2023, Practice and Exploration of OKR in the Construction of Grassroots Teaching Organizations in Universities. Education and Teaching Forum, 2023(46): 97–100.