

Exploration and Practice of Teaching Team Construction of Network Engineering Specialty in Local Application-oriented Undergraduate Colleges

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ABSTRACT. *The constant updating of network technology and the increasing expansion of network application scene put forward higher requirements for the knowledge, ability and quality of network engineering professionals. At the same time, it also puts forward new challenges to the full-time teachers of network engineering, and urges them to keep learning new knowledge and technologies and keep pace with the development of network technology. This paper analyzes the problems in the cultivation of network engineering professionals, probes into the construction measures of network technology core course teaching team, summarizes the achievements and shortcomings, and provides some references for the cultivation of network engineering professionals in local application-oriented undergraduate colleges and universities.*

KEYWORDS: *Teaching team, network engineering specialty, practice, curriculum construction*

1. Introduction

Network engineering is a branch of computer science and technology. Since the Ministry of Education issued the regulations on undergraduate majors of network engineering in 1998, many colleges and universities have set up network engineering majors. According to the national college information integrated query system of the China Education Online website, 387 undergraduate colleges and universities in China have set up network engineering majors in 2017, ranking 235 in the country in terms of application heat and 26 in engineering majors [1]. In the distribution of network engineering majors in various colleges and universities, nearly half of them are local application-oriented undergraduate colleges and

universities. For local universities and colleges, it is more important to combine local characteristics and cultivate talents to meet local economic development and social needs.

At present, with the continuous development of science and technology, new professional terms and technologies such as Internet of things, big data, cloud computing, software-defined network, Internet + and artificial intelligence are constantly emerging. With the continuous enhancement of social informatization, the continuous update of network technology, the continuous expansion of network technology application scenarios, the emergence of new network applications, the basic and overall role of network engineering is increasingly strengthened. The construction of safe, reliable and efficient network has become an inevitable choice under the new historical conditions [2]. At the same time, the development of network technology also puts forward higher requirements for network engineering professionals, and puts forward new challenges to the cultivation of talents in local application-oriented undergraduate colleges.

2. Problems in the Training of Network Engineering Professionals and the Importance of Strengthening Team Building

At present, the following common problems exist in the training of network engineering professionals in different types and levels of colleges and universities:

- Although the concepts of MOOC, micro-course and flipped classroom are widely known, most teachers still fail to conduct student-centered teaching and generally adopt traditional teaching methods, which are mainly taught by teachers [3-4]. Students are still in a passive listening position and have low enthusiasm to participate in course learning;
- Due to the insufficient construction of online course resources, the assessment means for students are still dominated by the final examination, and there is a lack of follow-up evaluation of students' learning process;
- With the rapid development of network technology, young teachers are short of teaching experience and engineering practice ability, so it is urgent to combine with the market demand of the industry, learn new knowledge and technology, and constantly recharge;
- Due to the professional title evaluation system and other reasons, young teachers are not highly motivated to participate in curriculum construction and specialty construction, and attach more importance to scientific research than to teaching [5].

Strengthening the construction of teaching team can enhance the cohesion of the teaching team, improve the engineering practice ability of the young teachers in the team, and stimulate the enthusiasm of teachers to participate in curriculum construction, specialty construction and discipline construction. It can not only improve the teaching level and teaching effect of teachers, but also promote the reform of teaching methods and accelerate the process of cultivating innovative

talents systematically. Through the construction of the teaching team, the theoretical knowledge level, practical ability and scientific research innovation ability of the network engineering students in our university will be improved, and a method and approach suitable for the cultivation of innovative talents of science and engineering students in our university will be explored.

3. Team Building Measures

In order to improve the teaching level of network engineering teachers in our university, the core course teaching team of network technology has been established, and the following construction measures have been taken.

3.1 Take the Team Member as the Core, Strengthens the Curriculum Construction and the Teaching Material Construction

The textbook is the foundation of the curriculum, and it is the key element of the reform of teaching content, curriculum system and teaching method [6]. The construction of the textbook with local characteristics and university characteristics is the guarantee of curriculum quality and the important foundation of quality engineering construction. Taking teaching team members as the core, writing characteristic textbooks is an important measure for university to improve teaching level. As the chief editor or deputy chief editor, the team members have published textbooks such as “network and information security”, “network security principles and applications”, “computer networks”, “network storage technology application project courses”, etc., which are gradually forming a complete set of network technology core course materials. In addition, the team members actively strengthen the development of core course resources of network technology, constantly enrich the network course teaching resources, and develop teaching websites of “Computer networks”, “Network security technology”, “Routing and switching technology”, and so on. These course website resources include relevant teaching documents, multimedia courseware, typical cases, knowledge point videos, online learning and testing system, etc., which provide great convenience for students’ learning and peers’ reference. Through continuous construction, the “Computer networks” course, which is under the responsibility of team members, has been approved by Guangdong provincial quality resources sharing course project, and the “Network security technology” has been approved by the university-level quality resources sharing course project.

3.2 Take the Team Member as the Core, Carries on the Teaching Methods and the Teaching Means Reform Positively

Through the establishment of online courses and the continuous improvement of course network resources, it provides the conditions and basis for the reform of teaching methods and means such as “flipped classroom”. The team carried out the reform of relevant teaching methods with the “Computer networks” course as a pilot.

In addition, the construction of online course resources also provides a guarantee for the reform of assessment methods and means. The online course testing module and the video learning tracking module monitor and track the whole process of students' learning courses, and provide a basis for the course assessment methods and means. Diversified evaluation methods have improved students' participation and enthusiasm in learning, and the evaluation results are more comprehensive and scientific, which are also welcomed by students.

Team teachers actively participate in teaching reform. In the past three years, they have participated in 12 provincial and ministerial-level quality engineering projects and teaching reform projects, and 9 university-level quality engineering projects.

3.3 Take the Team Member as the Core, Strengthens the Young Teacher Ability Training

The construction of network engineering teacher team is the cornerstone of cultivating innovative network engineering talents. In order to enhance the professional quality and ability of team teachers, on the one hand, team teachers are encouraged to visit home and abroad to improve their theoretical knowledge level. On the other hand, as an application-oriented undergraduate university, it is more important to train the "double-qualified" teachers and improve their engineering practice ability. It is a way to solve the insufficiency of the practical ability of teachers in school to adopt the school-enterprise cooperation, but the final solution is to improve the practical ability of the teachers in school. At present, the educational background and degree structure of young teachers of network engineering specialty in our university basically meet the requirements of the construction of university teaching staff. However, because most of the young teachers have no work experience in enterprises, lack of engineering practice experience and limited ability of actual project research and development, it is difficult to cultivate talents that meet the needs of the industry. Therefore, the construction of a professional teaching team with rich practical teaching experience is an urgent problem to be solved in the teaching of network engineering major in our university, and also a bottleneck problem affecting the improvement of practical teaching level. In order to cultivate the project research and development ability and engineering quality of the teaching team teachers, we and the cooperative enterprises jointly formulated the "double-qualified" teacher team training mechanism. The young teachers of our team take advantage of the winter and summer vacations to exchange and study in the cooperative enterprises every year to understand the cutting-edge technology of the network industry and make it reflected in teaching.

Through school-enterprise collaboration, the "double-qualified" teacher team training mechanism is jointly built, which focuses on solving the following four problems of young teachers in the team:

- Young teachers lack professional knowledge and the course teaching is not popular among students;

- Young teachers pay more attention to scientific research than teaching;
- Young teachers are not enthusiastic enough to participate in curriculum construction, specialty construction and discipline construction, and curriculum resources construction is backward;
- There are few ways for young teachers to carry out industry knowledge education.

Finally, the project practice ability of the young teachers in the team will be improved, the enthusiasm of the young teachers to participate in curriculum construction, specialty construction and discipline construction will be stimulated, and the cultivation of application-oriented innovative talents in the whole university will be driven.

Through nearly three years of training, the team teachers have learned Huawei's network technology and Internet of things related technologies in cooperative enterprises, and obtained HCNA certificate, HCNA certification instructor certificate, HCNP certificate, "National Software Professionals" certificate, "Advanced Software Development Engineer" certificate, "Internet of things development senior engineer" certificate, "information security engineer" certificate, etc.. The engineering practice ability has been strengthened, and the teaching effect has been further improved.

3.4 Take the Team Member as the Core, the Multi-level Practical Teaching Mode of "in-class + out-of-class, in-school + out-of-school" is Constructed

In addition to strengthening the basic practical teaching links such as the "experiment", "internship" and "course design" that are matched with the main courses, the following measures have also been adopted:

- IT culture competition and network technology competition. Our university holds an IT culture competition every year, and the team teachers are responsible for the guidance of network technology-related competitions. The annual IT culture competition provides opportunities and platforms for students to inspire their learning enthusiasm and enhance their practical ability. In addition, students are encouraged to participate in network technology competitions at the university-level, provincial-level, and national-level, to calculate innovative credits for award-winning students, and give them certain material rewards.
- To guide students to participate in various projects of college students' innovation and entrepreneurship fund. Team teachers plan in advance, guide students to apply for undergraduate innovation and entrepreneurship fund projects, guide students how to choose topics, how to write the application, and give specific guidance to students in the process of project development. After the completion of the project, instruct students to summarize the achievements and write research papers, and apply for software copyright or patent, etc. Through the implementation of various college students' innovation and entrepreneurship fund projects, cultivate students' innovative thinking, and further improve students' practical ability. In the

past three years, the team teachers have guided 10 college students' innovation and entrepreneurship fund projects, including 7 national-level college students' innovation and entrepreneurship fund projects.

- Outstanding students are encouraged to participate in teachers' research projects. Through IT culture competition, professional competition and college student innovation and entrepreneurship fund project, select some outstanding students to participate in the team teachers' scientific research projects, cultivate students' scientific research ability, and create conditions for students' further study.

- Students with strong practical ability are encouraged and recommended to enter ICT-related enterprises for internship, so as to achieve seamless connection between graduation and employment.

In addition, with team teachers as the core, we have established long-term and stable school-enterprise cooperative relations with many enterprises and institutions, and established a number of off-campus practice teaching bases, providing places for students to carry out practical training of engineering ability outside the school. In particular, we signed a cooperation agreement with Huawei Technologies Co., Ltd. on "Huawei institute of information and network technology" in 2015, providing a new way for students to learn ICT technology. By undertaking the preliminary competition of the first and second "Huawei network-courtyard cup ICT skills competition" in Guangdong region for two consecutive years, the popularity of the network engineering major of our university among colleges and universities in Guangdong province has also been enhanced.

4. Conclusion

Through three years of team building, a series of achievements have been achieved as follows:

- The team teachers guided the students to win 55 awards at the provincial level or above, especially in 2017, guided the students to win the first prize in the final of the "Huawei network courtyard cup" 2016-2017 international college students ICT skills competition;

- The team teachers guided students to obtain 12 "excellent graduation theses";

- The team teachers guided students to apply for 20 software copyrights and patents;

- The team teachers have won 2 first prizes, 2 second prizes and 3 third prizes of school teaching quality excellence award;

- "The construction and implementation of application-oriented innovative talent training model focusing on team building" won the second prize of the 9th education and teaching achievement award of the our university;

- In 2016, the network engineering major was approved as a university-level "characteristic major";

- In 2017, the network engineering major was approved as a construction project of “characteristic major” of Guangdong province.

Although the team has made some achievements in the field of teaching, there are still deficiencies in the work of scientific research to promote teaching, which is also the focus of the team’s next work. At present, with the continuous deepening of the reform of “supervision and service” in colleges and universities, colleges and universities have more autonomy. It is believed that the current situation of “emphasizing scientific research over teaching” can be broken, and the professional title evaluation will be linked to teaching ability, so as to stimulate teachers’ enthusiasm to participate in teaching activities.

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References

- [1] Information on <http://gkcx.eol.cn/>.
- [2] L.Q. Tian, A. J. Qiao: Requirement and hierarchical training about network engineer talent, *Agriculture Network Information*, (2012) No.4, p. 116-118+137.
- [3] X. F. Xu, Y. X. Fu, L. Li, et al: Thoughts on the development of computer education MOOC in China, *China University Teaching*, (2015) No.11, p. 6-10+30.
- [4] D. C. Zhan: Implementation plan of mixed teaching reform of “university computer” and “MOOC+SPOCs+ flipped classroom”, *Computer Education*, (2016) No.1, p. 12-16.
- [5] Y. Deng, X. H. Cheng: Discussion on the Personnel Training Mode of Network Engineering Major Facing Large Class Culture, *Computer Knowledge and Technology*, Vol. 13 (2017) No. 17, p. 154-156.
- [6] J. W. Xia, L. H. Zhang and D. L. Chen: Teaching team building as the starting point to promote the overall innovative talent training, *China Higher Education*, (2010) No.9, p. 37-38.