Research on the Training System of Professional and Skilled Personnel of Information Security Application Technology in Higher Vocational Colleges Under the Background of Modern Information Technology

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Abstract. Higher vocational education aims at cultivating high-skilled applied talents, guided by strengthening practical operation ability. This paper analyzed the current situation of the training system of professional and skilled personnel of information security application technology, and pointed out five problems, such as emphasizing theoretical knowledge learning but neglecting vocational ability training, disconnection between skill training system and vocational development, insufficient support of skill training mode for core courses, backward construction of base platform and lack of systematic evaluation on vocational skill evaluation. In view of the existing problems, reform measures were put forward to improve personnel training system.

Keywords: higher vocational education · school-enterprise cooperation · information security technology · talent training system · reform talent training system

1 Introduction

With the promulgation of Data Security Law and Personal Information Protection Law in 2021, a close linkage system has been formed with Network Security Law of the People's Republic of China. More attention has been placed on network security and data security in all sectors of society, and the demand for information security talents has increased [1]. In the context of accelerated development of the new generation of information technology, new formats and technologies are constantly emerging, and colleges and universities have gradually become the backbone of training high-quality professionals of information security, the Ministry of Education continues to hold the "Information Security Management and Evaluation" competition and attaches great importance to the training of professionals in information security technology application of information security technology application professionals. However, the training of talents in this major in China started late, and the professional development system is not perfect. Higher vocational colleges are in the primary stage of exploration for the cultivation of compound talents in information security [2].

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2 Problems in the Training System of Professionals of Information Security Application Technology in Higher Vocational Colleges

2.1 Emphasis on Theoretical Knowledge Rather Than Vocational Ability Training

The Application of Information Security Technology in vocational colleges involves disciplines such as computer, physics and communication, with a focus on practical operation and cross-disciplines. Its goal is to train skilled talents in the application of information security with strong operation ability and suitable for professional posts [3]. However, the courses of the application of information security technology in vocational colleges at present mostly adopt the courses of network security or computer science in ordinary colleges and universities. Because the majority of teachers are research-oriented, more systematic theoretical knowledge is delivered while teaching, with less attention on the feature of training on skilled talents in vocational colleges.

2.2 Skills Training System is Out of Touch with Career Development

The orientation of the training system of application of information security technology constructed by vocational colleges is not explicit, and it is not well-matched with employment, work and career plan of graduates in this field. As for their future career, the choices in talent training plans of higher vocational colleges are mostly described as work engaged in computer and network security in enterprises, institutions, IT companies, etc. [4]. It does not list the jobs and their actual work, without providing students with specific and professional guidance. The phenomenon that what they have learned is out of touch with the work of professional posts often occurs.

2.3 Basic Courses Receive Insufficient Support from Skill Training Mode

The application of information security technology tends to be a branch of computer in vocational colleges. After it is approved as an independent specialty, the curriculum system still adopts the skill training plan of the original direction, with still too much focus on courses of computer network and data structure, and lacks the study of network security, cryptography, management, law and other fields. At the same time, with insufficient experienced teachers, and practical teaching, and no close combination of local demands and the field, students' interest in learning and also their efficiency are affected to a certain extent. Besides, basic courses have not been fully practiced and applied.

2.4 Backward Platform and Base for Professional Skills Training

The platform and base for professional skills training constitute one of the basic supporting conditions for training high-quality skilled talents. At present, the training places in vocational colleges are mainly computer training room, without enough projects and training bases closely-connected to real working environment. [5].

2.5 The Construction of Vocational Skill Evaluation System is Imperfect

Vocational skills evaluation system in higher vocational colleges needs to be improved in the training of compound talents of information security technology. In 2019, the State Council issued the "Implementation Plan of National Vocational Education Reform", deepened the training mode of compound talents, and piloted the system of "Academic Certificate + Several Vocational Skill Level Certificates" in various higher vocational colleges [6]. At present, in the curriculum of the application of information security technology, academic education and vocational skills training are not well integrated. The unique advantages of schools are not fully exerted, and the training direction for professionals of the application of information security technology in a certain field has not been determined. The imperfection of vocational skills evaluation system is not conducive to learners' clear career goals, enterprises' mastery of job seekers' professional abilities, and vocational education reform.

3 Practice and Thinking on Training Talents of the Application of Information Security Technology in Higher Vocational Colleges

3.1 Planning "Two-Body, Four Layers and Five Docking" Progressive Training System

According to the school-enterprise cooperation mode and the work content of professional posts, taking schools and enterprises as the main body, a progressive skill training system with four levels is developed: basic practice level, advanced practice level, comprehensive practice level and innovative practice level, as shown in Fig. 1. Enterprises and schools give full play to their respective advantages, connecting specialty setting with job requirements, curriculum setting with professional standards, teaching implementation with on-site work, training base with on-site working environment, and teacher training with experts and tutors. The progressive training system of "two-body, four-layer and five-docking" focuses on the training of ability, strengthening the practical teaching links, highlighting the training of students' professional ability, employment and entrepreneurial ability, and forms the teaching characteristics as sustainable development.

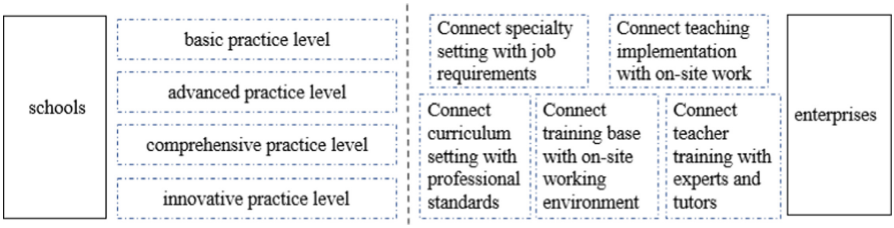

Fig. 1. "Two-body, Four Layers and Five Docking" Progressive Training System Planning [Owner-draw]

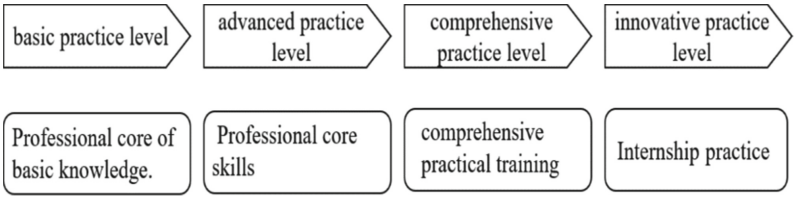

Fig. 2. "Practical Action Project" training mode [Owner-draw]

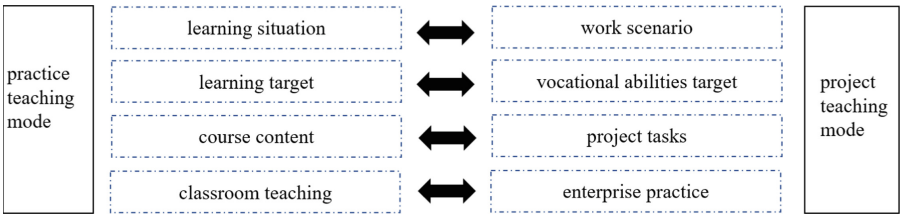

Fig. 3. The curriculum system of "stage training and progressive ability" [Owner-draw]

3.2 Optimizing "Practical Action Project" Makes Skill Training Mode

Combined with working scenes of the specialty, this paper studied the action-oriented project-based skills training mode [7]. Teaching material numerated typical working scenarios in the field of information security, collected and upgraded professional knowledge according to the integrity of project development activities, and found theoretical knowledge supporting professional core skills. In the teaching process, taking the project as the carrier, reorganizing the curriculum structure, connecting with the enterprise project development, organically integrating the curriculum content with the project task, organically integrating the teaching case with the example demonstration, organically integrating the classroom teaching with the enterprise practical training to realize the action-oriented project-based skill training mode which is based on the design of work scenes [8] (Fig. 2).

3.3 Formulation of Curriculum System for Training Skilled Talents with "Stage Training and Progressive Ability"

In the study, we explored the cooperation between specialties and industries; collected and analyzed the existing professional standards related to the application of information security technology; clarified the specifications and standards of vocational skills training for students in higher vocational colleges; built a curriculum system of "stage training and progressive ability" for skilled personnel training according to different training circles [9] (Fig. 3).

Fig. 4. "A Four-Pronged Approach" training platform [Owner-draw]

3.4 Establishing "A Four-Pronged Approach" Training Platform for Professional Skills About Intelligent Interconnection and Collaborative Innovation

Following the gradual training law, we created a practical teaching environment with dual functions of production and teaching, and built a professional skills training platform for intelligent interconnection and collaborative innovation in and out of campus, which integrates four practice bases: "basic practical skills", "advanced practical skills", "comprehensive practical skills" and "innovative practical skills", as shown in Fig. 4. Besides, we optimized facilities of the existing training room to build a practical environment for students [10] and we also cooperated with many enterprises in the field such as Asia Info and Dbappsecurity to carry out extracurricular team competition, scientific research, technological innovation and other activities. Through the in-depth cooperation between schools and enterprises, the "four-pronged approach" training platform for professional skills about intelligent interconnection and collaborative innovation is built to guarantee the specialization and hierarchy of talents training of the application of information security technology [11].

3.5 Building a High-Level Team with "Double-Qualified" Teachers

According to the requirements of the Ministry of Education and the Provincial Department of Education on improving the quality of teachers in vocational colleges, this paper explored the training mechanism of "double-qualified" teachers [12] [13]. The school cooperates with advanced enterprises, formulates enterprise practical training and training teaching training programs, and integrates theoretical knowledge with practice, carry out "one-on-one" pairing of teachers and enterprises, strengthen the integration of school teachers and enterprise engineers, set up a network security competitive team, and participate in technical skills training and network security competitions organized by the provincial government and industries. Schools and enterprises jointly carry out personnel training and scientific research, and cultivate "double-qualified" high-level teachers with professional characteristics.

3.6 Construction of Index System of Professional Ability Evaluation

The advantages of the specialty should be fully exerted. According to the evaluation standard of skill level on network security staff of State Grid Corporation of China and the requirements of "1 + X" certificate of Ministry of Education [14][15], integrated with the core knowledge of vocational education of the application of information security technology, this paper analyzed and formulated the evaluation index and weight of vocational ability of the application of information security technology, and designed the evaluation standard system of professional ability of vocational education in information security.

4 Conclusion

In the context of complex and ever-changing network environment, it has become an urgent need for all walks of life to cultivate talents in the application of information security. The training of information security talents needs strategic guidance, policy encouragement and multi-cooperation. Through school-enterprise cooperation, technical and equipment resources are coordinated; "double-qualified" teachers are trained; systematic professional courses and project-based practical cases are set up, and an all-round training plan at multi-level for information security professionals is formulated to improve the training effectiveness of security talents with practical skills.

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