Problems and Countermeasures of Computer Applied Talents Training Under the Background of "Production-Education Integration and Collaborative Education"

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Abstract: From the perspective of "combining production and education, cooperatively educating people", the paper takes the computer major of Xianyang Normal University as an example, deeply analyzes the current situation and existing problems of the training of applied computer talents, and puts forward corresponding countermeasures and suggestions. This study finds that there are some problems in the process of computer talent training, such as delayed updating of teaching content, disconnection between theoretical teaching and practical teaching, insufficient practical experience of teachers, and insufficient training of students' innovative ability. In order to solve these problems, this study puts forward some improvement strategies such as co-building course resources with enterprises and introducing enterprise tutors. It aims to realize the deep integration of education chain, talent chain, industrial chain and innovation chain, and promote the comprehensive development of computer application talents. Through this study, the purpose is to provide some references for universities and enterprises to improve the degree of computer graduates and social needs.

Keywords: Integration of Production and Education; Computer Applied Talents; Personnel Training Mode; School-Enterprise Cooperation

1. Introduction

Computer science plays an important role in today's society and economic development. It is not only an important driving force for scientific and technological progress, but also a key factor in economic transformation and upgrading, social management and service improvement. In the future, with the continuous progress of technology and the continuous expansion of application fields, the importance and influence of computer science will be further enhanced. The integration of industry and education refers to the combination of education and industry, guided by the needs of industrial development [1], in order to improve the quality of talent training, optimize educational resources, and promote the coordinated development of industry and society.

2. The Background of "Integration of Production and Education and Collaborative Education"

In foreign countries, many developed countries began to explore the combination of education and industry after the industrial Revolution, in order to enhance students' practical ability and innovation ability. For example, in 1906, the University of Cincinnati in the United States adopted the practice of cooperative education to cultivate students' practical ability through alternate study and learning [2]. With the deepening of the practice of production-education integration, some countries begin to formulate relevant policies and standards to standardize the implementation of production-education integration. For example, after the Canadian Association for Cooperative Education (CAFCE) was established in 1973, it developed the certification process and certification standards for the integration of industry and education (cooperative education) to ensure the teaching quality of talent cultivation [3]. Many countries and regions are

drawing on and learning from the successful experience and practices of other countries in the integration of industry and education, and carrying out innovation and practice in light of their own realities.

With the rapid development of China's economy and the continuous upgrading of its industrial structure, the demand for high-quality and highly skilled personnel is growing. The traditional education model often focuses on the imparting of theoretical knowledge, but lacks the close combination with the actual industrial demand, resulting in a certain disconnect between talent training and market demand [4]. Therefore, the concept of production and education integration and collaborative education came into being, aiming to cultivate more high-quality talents who meet the market demand through the deep integration of education and industry [5].

In China, a series of major deployments have been made around the integration of industry and education: For example, the "National Pilot Implementation Plan for the Integration of Production and Education Construction" issued in 2019, the "Measures for the Management of Industry-University Cooperation and Collaborative Education Project of the Ministry of Education" issued in 2020, and the "Notice of the Ministry of Education on the development of city-wide Industry-education Consortium Construction" issued in 2023, etc., the introduction of this series of policies provides a solid policy guarantee and institutional support for the integration and collaborative education of production and education. In addition, foreign scholars have also studied the training mode combining industry, university and research, that is, by combining academic research, education and training with industrial development, knowledge innovation and application can be promoted [6].

The new round of global scientific and technological revolution and industrial transformation led by innovative technologies such as big data, artificial intelligence, Internet of Things and blockchain has entered a period of unprecedented intensive activity, giving birth to a large number of new industries, new occupations and new business forms. How to continuously and effectively promote the integration of production and education and collaborative education model is also facing new challenges [7].

3. The Measures of Computer Professional Production-education Integration

This research selects four undergraduate majors in the School of Computer Science of our university as the research object, and the four majors are distributed as computer science and technology, software engineering, Internet of Things engineering and intelligent science and technology.

3.1 Take Effort to Construction of Collaborative Education Practice Teaching Base

The talent training of the School of Computer Science takes "application" as the goal, practice as the starting point, and collaborative education as the platform. Under the relationship and support of school leaders and the funding of relevant national policies, the School of Computer Science actively carries out school-enterprise cooperation and collaborative education, mainly including: In July 2020, our school cooperated with Xi 'an Blue Snow Software Information Technology Co., Ltd. to establish a school-enterprise cooperation software research and development base in our school, and set up a professional practice base in Xi 'an Blue Snow Software Information Technology Co., LTD. In November 2020, the first excellent Engineer class of the School of Computer Science opened. In October 2021, our college cooperated with Binzhou Jingyuan Education Group to set up our school's practice training base in Binzhou Jingyuan Education Group, and set up the national Youth robot level examination center in our school. In July 2022, our Institute signed a practical teaching base for production and education collaborative education with Xi'an Shenyang Aircraft Information Intelligent Engineering Co., LTD. In addition, our college has also established a collaborative education practice teaching base in more than 20 enterprises and institutions, such as Xi'an Blue Gout Information Technology Co., LTD., Zhongsoft International (Xi'an) Base, Xi'an Yuezhu Technology Co., LTD., Xianyang City Big Data Administration Bureau.

3.2 Actively Apply for the Ministry of Education Industry-university Cooperative

Education Project

In order to improve the quality of undergraduate talent training, deepen the integration of industry and education and school-enterprise cooperation, the Department of Higher Education of the Ministry of Education organizes relevant enterprises to support colleges and universities to jointly carry out the project of industry-university cooperation and collaborative education [8]. In 2017, since the establishment of the project, the School of Computer Science has actively connected with relevant enterprises, organized relevant teachers to apply for the project, and obtained a total of 19 approved projects (see Table 1). The establishment and construction of this project has made our college realize seamless docking with relevant enterprises in the construction of practical conditions, training of teachers, and landing of engineering projects. Through cooperation, we are exposed to the latest achievements and application technologies of information technology enterprises in a timely manner in the process of personnel training, which broadens the knowledge horizon of teachers and improves the application ability of students.

Table 1. Statistics of the Ministry of Education's Industry-University Cooperative Education Projects

Serial Number	Project Number	Name of Project	Time
1	201701026049	Construction of Off-Campus Practice Base of Xianyang Normal University	2017
2	201701026046	Exploration and Practice of Transformation and Upgrading Path of Computer Science and Engineering Specialty Facing new Intelligent Economic Model	2017
3	201702170013	Big Data Technology Comprehensive Laboratory	2017
4	201702146017	Computing and Big Data, Embedded/Internet of Things, VR/AR Professional Teaching Content and Curriculum System Reform	2017
5	201702018046	Internet of Things Professional Enterprise Practice Training	2017
6	201801193083	Embedded System Design and Development Teaching Reform project	2018
7	201902293049	Innovation and Entrepreneurship Training Based on Artificial Intelligence	2019
8	202002183035	Big Data Teacher Training for Computer Science and Technology Majors	2020
9	202002293014	Reform and Research of Computer Science Curriculum System under The Background of New Engineering	2021
10	202102076084	Big Data Teacher Training for Computer Majors in Local Normal colleges Under the Background of New Engineering	2021
11	202101037026	The Teaching Ability of Teachers Majoring in Internet of Things Engineering is Improved	2021
12	202101087056	The Practical Ability of Python Artificial Intelligence Teachers is Improved	2021
13	202102330021	Computer Big data Orientation Double Teacher Training	2021
14	202101363027	Computer Hardware Curriculum system Reform Under the Background of Integration of Production and Education	2021
15	202101157015	Construction of Practical Teaching System of Computer Science and Technology Specialty Under the Background of Integration of Production and Education	2021
16	220605211090405	Practice on Training Model of Internet of Things Engineering Professionals Based on Artificial Intelligence	2022
17	220602631020802	Java Curriculum System Teacher Training Under the New Engineering Background	2022
18	220803631270021	Big Data Teacher Training for Computer Majors in Local Undergraduate Colleges for New Engineering	2022

3.3 Strengthen the Training of "Double-qualified" Teachers

According to the spirit of the relevant documents of the school, the School of Computer Science has carried out the re-improvement of the engineering training ability of the teachers on the job through single-subject training, domestic study visits, temporary posts in enterprises and professional ability improvement training. In recent years, a group of teachers have successively obtained the industry qualification certification or the "double qualified" teacher identification organized by our school. At present, the proportion of "double qualified" teachers in our school has reached 65.7%, which provides teacher guarantee for cultivating students' engineering application ability.

3.4 Students' Professional Skills are Improved through Discipline Competitions

The School of Computer Science encourages students to participate in various disciplinary competitions. In recent years, students have won a number of national and provincial awards in various disciplinary competitions such as Blue Bridge Cup National Software and Information Technology Professionals Competition and China University Student Computer Design Competition (as shown in Figure 1). Through the discipline competition, the professional skills are improved, and the competitiveness of students in employment is increased.
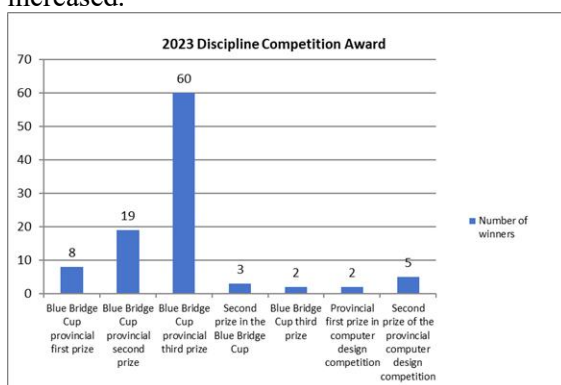

Figure 1. Some Awards in the 2023 Discipline Competition

4. There are Some Problems in the Training of Computer Applied Talents

In recent years, with the goal of cultivating "applied" talents, driven by the policy of integrating production and education into collaborative education, the School of Computer Science has made some achievements in the construction of practice bases, the application of collaborative education projects of the Ministry of Education and the training of "double qualified" teachers, and has successfully cultivated a group of high-quality applied talents serving the information technology industry. It meets the requirements of the society for the professional ability of computer graduates. This time, we conducted in-depth research on application-oriented talents cultivate by visiting employers, returning visits to graduate alumni, holding seminars for students and analyzing the employment of graduates. Through the investigation, it is found that our hospital has made some achievements in the training of application-oriented talents, but there is still a certain gap with the requirements of application-oriented talents training. The main problems are as follows:

4.1 Computer Technology Changes Rapidly, and the Knowledge in Textbooks often Lags behind the Needs of the Industry

The speed of computer technology is very fast, new technologies continue to emerge, and traditional technology will soon fall behind. This makes it necessary to keep up with the latest technological trends to ensure that students are equipped to face the challenges of the future.

4.2 The Practical Ability of Teachers Needs to be Further Improved

Application-oriented talents need to have rich practical experience, but some teachers are rich in theoretical knowledge, lack of practical experience, practical teaching often cannot reach the expected effect, in the process of graduation design guidance is often "let students play".

4.3 Lack of Innovative Ability Training for Students

Applied talents not only need to master existing technologies, but also need to be innovative, able to solve problems and create new solutions in practical applications. However, some teaching modes and curriculum Settings may limit the cultivation of students' innovative thinking and practical ability.

4.4 Professional Practice is Difficult to Manage, a Small Number of Students Perfunctory

Professional practice is not only the key link of training applied talents, but also the key to sublimating the theoretical knowledge and the most effective way to transform knowledge into ability. Some college students do not know in place, often on the grounds of tight time for postgraduate entrance examination, perfunctory. Especially during the three years of COVID-19, internships were forced to be carried out online or on campus, which seriously affected the quality of professional internships.

4.5 The Achievement Degree of Graduates' Employment Industry and Professional Training Goals Needs to be Further Improved.

According to the statistics and analysis of the employment data of 223 students in the School of Computer Science in 2023, the employment industry covers 17 industry fields, among which 111 are employed in the information transmission, software and information technology service industry, 35 are employed in the education direction, and other industries are shown in Figure 2. According to the proportion of employment in various industries, the employment in information transmission, software and information technology services accounted for 49%, the employment in education accounted for 15%, and the employment in other industries accounted for as shown in Figure 3. It can be seen from the analysis of data that the degree of achievement of the employment direction and professional training objectives of graduates majoring in computer science [9] is not high, and the employment industry of students is relatively scattered.
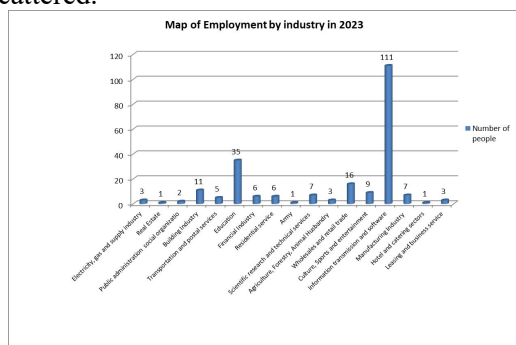

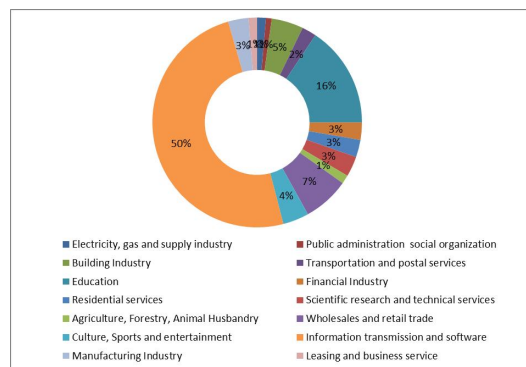**Figure 2. The Distribution of Employment by Industry in 2023**

Figure 3. The Proportion of Employment in Each Industry in 2023

5. The Countermeasures of Training Computer Applied Talents under the Background of Integration of Production and Education

Through the analysis of the above problems, in order to improve the quality of computer application-oriented talents training start from the following aspects:

5.1 To Construct the Curriculum Resources with Enterprises

In addition to courses with unchanged basic theories such as specialized basic courses, professional courses with strong application can introduce new technologies and methods of enterprises and industries [10]. Facing the forefront of science and technology, courses can be jointly developed with enterprises and industries to meet the real-time needs of computer majors for the industry, and actively docking social needs.

5.2 Enterprise Engineers are Used to Promote the Improvement of Teachers' Practical Ability

In the selection of the graduation thesis of the class of 2024, a group of enterprise practical projects are selected. In the graduation thesis guidance process, two mentors are adopted, that is, the enterprise mentor is responsible for the engineering and technology guidance of the students, and the academic adviser is responsible for the writing of the academic paper, including the paper format, literature search and paper structure. During the guidance process, students, business tutors and school instructors should communicate closely and fully to ensure the quality of the graduation thesis. Through the guidance process of the graduation thesis, the practical

ability of the instructors in the school is gradually promoted.

5.3 To Reform the Personnel Training Model

According to the development of computer technology and the society's ability requirements for computing graduates, combined with the basic goal of collaborative education, we constantly innovate the training mode of talents. We will optimize the curriculum of computer science and technology, add lectures related to cutting-edge technology and emerging fields, introduce interdisciplinary courses, encourage students to cross-learn in different fields, and cultivate innovative talents with all-round development. Encourage students to participate in innovation competitions and teachers' scientific research projects to cultivate students' innovation awareness and innovation ability. In 2023, the undergraduate tutor system will be implemented, and the tutors assigned to undergraduates will provide guidance to students in life, study, career planning and other aspects. To ensure that college students in the right direction under the guidance of the healthy growth of talent.

5.4 Strengthen the Construction of Practice Links

Constantly improve the professional practice system of computer school, strengthen the process management of practice links. Establish a four-level internship management system of "school instructor - internship unit leader - internship leader - College internship leader", and clarify the responsibilities and obligations of each level according to the progress and management of internship work.

According to the internship direction, select the internship enterprises with high compatibility with the training direction. Continuously enrich the forms of internship to meet the diversified needs of college students, and provide a variety of internship methods, such as on-the-job internship, government temporary post, paid internship.

Strengthen cooperation with local governments and enterprises, tap local project resources, rely on horizontal topics, and combine internship tasks with horizontal projects. It not only improves the ability to serve local economic construction, but also opens up practical project resources and improves the practical ability of students.

5.5 Promote the Deep Integration of Schools with Enterprises and Industries

To accelerate the deep integration of industry, university and research led by enterprises, it is necessary to give full play to the respective advantages of universities and enterprises, and solve the problems of "what enterprises dominate, what schools and enterprises integrate, where to integrate, and how to deeply integrate" [11]. According to the survey of 223 employed students of the School of Computer Science in 2023, the main reason for the low achievement of graduates' employment industry and professional training goals is that they fail to meet or excel in their studies and lack of industry competitiveness, which accounts for 76.3%. The integration of production and education is an effective way to meet the needs of society. Therefore, the training of computer talents must be deeply integrated with enterprises and industries. We can try to cooperate with enterprises to build industrial colleges, set up order classes, and establish "micro-majors" for subject introduction knowledge [12] to build new collaborative education mechanisms, innovative training mechanisms, optimize curriculum systems, build practice platforms, and establish diversified evaluation systems to promote the "integration of production and education".

6. Conclusion

At present, the rapid development of information technology provides us with both opportunities and challenges. To improve the quality of talent training, first of all, we must keep up with the needs of society, constantly update the knowledge structure, and innovate the talent training model. Secondly, it is necessary to break through the barriers between college talent training and student employment, and promote talent training and employment work in concert. Finally, we should take the quality of talent training as an important indicator of performance assessment, and create a good atmosphere for everyone to pay attention to talent training and everyone to participate in talent training. Only in this way can we continuously improve the degree of graduates' employment industry and training

goals, and finally achieve the goal of high-quality employment.

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