Research and Exploration on Cultivation of Characteristic Top-notch Applied Talents of Computer Science Major in the Context of New Quality Productivity

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Abstract. With the rapid rise of emerging technologies such as artificial intelligence, big data, cloud computing and the Internet of Things, the computer science profession is experiencing unprecedented opportunities and challenges. Therefore, it is particularly important to cultivate application-oriented talents with innovative consciousness and excellent practical ability. Although the computer science major still receives attention under the background of "Internet+", it has also revealed some developmental deficiencies in recent years. The training mode of local undergraduate applied colleges and universities mainly focuses on the development of applied talents to meet the needs of new technology, new industry and new economy. Therefore, we urgently need to explore and establish a training system for top-notch applied talents suitable for computer science majors from the perspective of new quality productivity. This study aims to build a talent cultivation system with computer characteristics guided by new quality productivity, optimise the curriculum, strengthen practical teaching and enhance the construction of disciplines through the introduction of cutting-edge technologies and innovative teaching methods, so as to cultivate high-level talents with distinctive characteristics, enhance students' innovation and practical ability, and promote the further development of the computer profession.

Keywords: New Quality Productivity, Computer Programme, Featured Top-Notch Applied Talents

1 Introduction

With the continuous emergence of emerging technologies such as artificial intelligence, big data, cloud computing and the Internet of Things, computer science majors are facing unprecedented opportunities and challenges. Under the impetus of "Internet+", the computer science major has been maintaining a high degree of enthusiasm, but in recent years, the deficiencies in its curriculum construction and talent cultivation mode have

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become more and more obvious. In local undergraduate applied colleges and universities, talent cultivation mainly focuses on the application mode, although this mode meets part of the market demand, but the cultivation of innovation ability is very insufficient in the rapidly iterating new technology environment. At present, educational institutions tend to focus too much on application-oriented software programming, such as applet development, resulting in a curriculum that is too limited to programming. Although some colleges and universities have tried to introduce emerging technologies such as cloud computing and big data processing, however, these endeavours are more about following technological developments rather than solving the problem at its root. Therefore, in order to cultivate high-quality innovative and applied talents, the education system needs to keep abreast of the times, especially in the perspective of new productivity, how to change from "new" to "quality" will become the key to realise the cultivation of top-notch applied talents with computer characteristics.

Since the Ministry of Education (MOE) promoted the construction of new engineering disciplines [1] in 2017, the reform pressure on computer science majors has become more and more obvious. The implementation of the "Double Ten Thousand Plan" [2] by the Ministry of Education and the rise of emerging professions such as artificial intelligence and intelligent manufacturing signify that the new quality of productivity provides a new impetus for technological innovation [3]. In this context, all disciplines must carry out knowledge updating and connotation re-construction to meet the requirements of the new era. Although the computer science profession faces many challenges, this also provides it with brand new opportunities. As each discipline strives to be first-class, more and more majors begin to develop in the direction of "intelligence" and "wisdom", and the declaration of new majors often includes keywords such as Internet, digital, intelligence, etc., which not only reflects the development of disciplines in keeping with the times, but also highlights the importance of computer science as the foundation of other disciplines. This not only reflects the development of the discipline with the times, but also highlights the fundamental position of computer science in other disciplines. Colleges and universities are actively creating their own advantageous majors, taking the "Double Ten Thousand Plan" as the goal and committing themselves to the construction of first-class disciplines, and this process inevitably requires the comprehensive upgrading and transformation of traditional majors[4-5].

As a large category of disciplines, the computer profession has a wide range of knowledge content and numerous professional directions, and its accumulation and heritage give it an advantage in the upgrading process. While meeting the needs of regional economic and industrial development, computer majors should actively integrate new technologies and update their knowledge systems. Drawing on the construction experience of emerging majors and the feedback information provided by graduates will provide valuable guidance for the development and reform of computer majors. By deepening the construction of disciplines and cultivating top-notch talents with innovative consciousness and practical ability , the computer profession can not only conform to the trend of the times, but also maintain its competitiveness in the future development and achieve sustainable development[6].

2 Realistic Problems in the Training of Computer Professionals

The main problems facing the training of computer professionals include the imperfect theoretical system and the lagging update of the curriculum content, the insufficient practical links and the weak practical teaching, as well as the insufficient depth of school-enterprise cooperation and the insufficient innovation of the educational model. Current research lacks a systematic theoretical framework, and the curriculum fails to respond to the development of emerging technologies in a timely manner, resulting in students' insufficient mastery of cutting-edge knowledge. At the same time, the lack of practical teaching resources and platforms restricts students in their practical operation ability and innovation ability. In addition, the form of school-enterprise co-operation is relatively superficial, failing to effectively dock the internship and employment needs of students, and the traditional teaching mode is still dominant, hindering the enhancement of students' independent learning and innovation ability. Therefore, it is urgent to carry out a comprehensive reform of the talent training system to adapt to the rapidly changing technological environment and market demand.

2.1 Incomplete Theoretical System and Lagging Behind in Updating Course Content

The current research on talent cultivation of computer majors mainly focuses on specific teaching methods and practical exploration, and lacks a systematic theoretical framework and guidance, which leads to the inadequacy of the theoretical system. Many colleges and universities have failed to form a unified standard and norms in curriculum design, resulting in fragmentation of teaching content. The lag in updating the curriculum content is mainly reflected in the inability to respond in a timely manner to the needs of the rapid development of emerging technologies, especially in the fields of artificial intelligence, big data, blockchain and so on[7-9]. With the rapid rise of these technologies, traditional curricula are unable to cover the relevant knowledge, resulting in students' insufficient understanding and application of new technologies. Therefore, there is an urgent need to establish a systematic curriculum system that includes both core basic courses and covers cutting-edge technologies and application practices, so as to cultivate students' comprehensive literacy.[10-11]

2.2 Inadequate Practical Sessions and Weak Practical Teaching

The insufficient design and implementation of practical teaching links is mainly reflected in the lack of effective practical platforms and resources. The construction of laboratories and internship bases in many colleges and universities is relatively weak and cannot provide students with sufficient opportunities for practical operation. Especially when it comes to the application of emerging technologies such as big model platforms, students often lack real project experience and are unable to effectively transform theoretical knowledge into practical ability. This situation directly affects students' innovative ability and ability to solve practical problems. In addition, practical teaching is often regarded as complementary rather than core and lacks sufficient attention, which leads to students encountering difficulties in practical application. Therefore, colleges and universities need to invest more to improve the conditions for practical teaching, create more real project practice opportunities, and enhance students' practical ability and innovation consciousness.

2.3 Insufficient Depth of School-Enterprise Co-operation and Insufficient Iinnovation in Education Mode

Although some colleges and universities have established co-operative relationships with enterprises, the overall depth and breadth of co-operation is still insufficient. This phenomenon has led to a lack of smooth docking between students in the internship and employment segments, affecting their employability and market competitiveness. The forms of university-enterprise co-operation are often limited to simple internship arrangements, and fail to form an in-depth mechanism for integrating teaching and practice. In addition, although some colleges and universities have begun to experiment with new educational modes such as project-based learning and flipped classroom,[12] however, traditional didactic teaching is still dominant, and the cultivation of students' independent learning and exploratory ability is insufficient. This makes students lack the ability to adapt and innovate when facing the rapidly changing technological environment. Therefore, colleges and universities should actively explore the in-depth co-operation mode with enterprises, build a mechanism for collaborative education between schools and enterprises, and at the same time innovate in the education mode to cultivate students' independent learning ability and innovative thinking to meet the needs of future career development[13-16].

3 Measures for the Cultivation of Specialised Top-Notch Applied Talents in Computer Specialities

Discussing the reform of computer professional talents training in local undergraduate colleges and universities in the context of new quality productivity, it is emphasised that colleges and universities need to combine the characteristics of the local economy and cultivate high-quality applied talents in order to promote economic development. Computer majors face the challenge of homogenisation and need to enhance their characteristics and competitiveness through multidisciplinary crossover and the introduction of emerging technologies.[17] At the same time, the curriculum system should be dynamically adjusted to ensure that it meets the needs of the industry and enhances the practical and innovative ability of students. School-enterprise co-operation and diversified academic competitions are important strategies to improve the quality of education, stimulate students' interest in learning new technologies through the integration of resources and practical experience, and ultimately deliver high-quality applied talents to the society and contribute to high-quality development.Figure 1 shows the general framework for the training of top-notch applied talents with computer specialities under the perspective of new quality productivity.

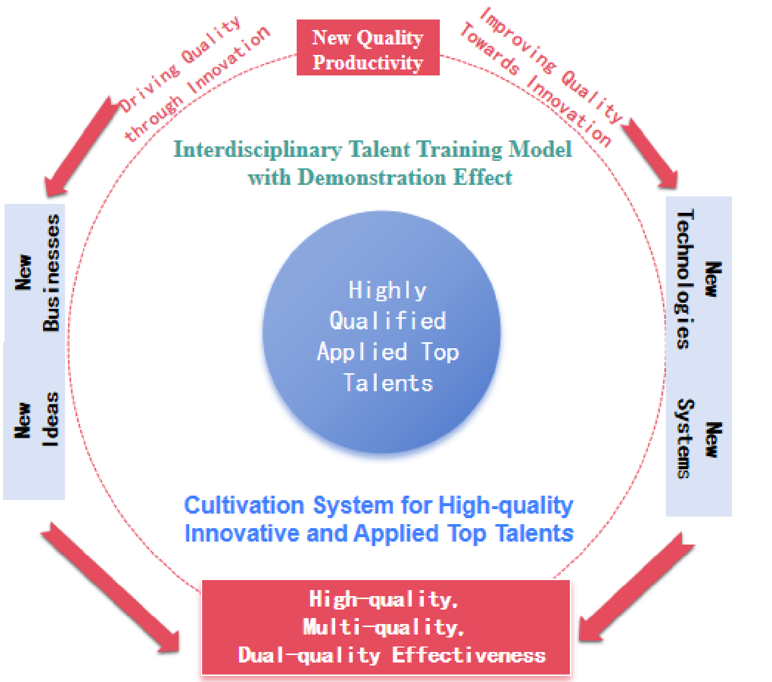

Fig. 1. Overall framework for the cultivation of top-notch applied talents with computer characteristics under the perspective of new quality productivity.

3.1 Enhanced Talent Development Within an Integrated Framework of New Quality Productivity

New-quality productivity is the core driving force behind the transformation and upgrading of the modern economy, which is mainly reflected in the integrated development of new technologies, new industries and new energy sources, as well as the resulting digital economy. The concept is rich in connotations, covering the qualitative change in productivity levels and the need for high-quality development, and reflecting higher requirements for the quality of talent, innovation capacity and industrial adaptability in the process of socio-economic development. As the driving force of the new era, the new quality productivity not only emphasises the continuation of traditional productivity, but also pays special attention to the development of emerging industries driven by innovation. Therefore, colleges and universities, especially local undergraduate colleges and universities, as an important base for cultivating high-quality applied talents, must closely combine with the economic characteristics and development needs of the region to fundamentally strengthen the strategic layout of talent cultivation.

Against this background, local universities should take the initiative to adapt to the changes in the digital economy and emerging industries, and formulate talent cultivation strategies that are in line with them. This includes not only the innovation of curriculum and teaching methods, but also the close connection with the local economy to ensure that the cultivated talents can quickly integrate into the local market and solve practical problems. By basing themselves on local realities and focusing on the application of new technologies and the rise of new industries, local universities can not only inject new vitality into the local economy, but also enhance their own brand image through the cultivation of outstanding talents with special characteristics, and then play a key role in the construction of first-class disciplines, first-class majors and first-class curricula. This strategy will promote the overall development of social economy, enhance the ability of universities to serve the society, and truly realise the purpose of "education for the people".

3.2 Characteristics of the Computer Science Programme and Directions for Reform

After decades of development, the computer major has faced serious challenges in its curriculum and talent cultivation mode, from the early basic programming to the current artificial intelligence, machine learning and other cutting-edge fields. The main problem at present is the serious phenomenon of professional homogenisation, and the computer majors of many colleges and universities are converging in terms of curriculum content and training objectives, lacking unique training characteristics. This homogenisation not only restricts the innovation ability and employment competitiveness of students, but also leads to the failure to effectively meet the diversity of social demand for computer professionals.

Under the background of new engineering, computer majors must re-examine their own characteristics and carry out innovative reconstruction with the perspective of new quality productivity, aiming to cultivate high-quality composite talents in line with market demand. To this end, colleges and universities should strengthen their attention to and research on emerging technologies, promote multidisciplinary cross-fertilisation, and cultivate applied talents who have a solid foundation in computer science and are also able to flexibly use new technologies. At the same time, it is necessary to make full use of the characteristics of the local economy, combined with the opportunities for the development of Guangdong, Hong Kong and Macao Greater Bay Area, to optimise the talent training programme, to ensure that the training objectives are closely integrated with the development of the regional industry, so as to achieve an effective docking between talents and the market.

When implementing the characteristic development, the computer major needs to carry out in-depth reforms around the following aspects: firstly, reconstructing the curriculum system and adding courses related to cutting-edge technologies to meet the ever-changing market demands; secondly, strengthening the practice link, providing real project experiences through cooperation with enterprises, and enhancing students' practical ability; finally, establishing the mechanism of school-enterprise cooperation, and promoting the disciplinary construction and the local economic deep integration, and realise the sustainable development of talent cultivation.

3.3 Dynamic Adjustment of Curriculum System and Talent Training Programme

In order to improve the quality of talent training for computer science majors, reform of the curriculum system is an indispensable link. At present, emphasis should be placed on the addition of courses related to emerging technologies and the design of the curriculum in combination with interdisciplinary needs. Such a curriculum system should not only cover the knowledge of such cutting-edge fields as artificial intelligence, data science, and big data analysis, but also organically combine with traditional computer courses to form a diversified and flexible curriculum system that can adapt to the interests and career development directions of different students.

In addition, colleges and universities should dynamically adjust their talent training programmes to ensure that the content of the curriculum is always in line with the latest trends in industry development. This adjustment process should be based on extensive research and feedback, taking into full consideration the advice of industry experts and feedback from former students, to ensure that the curriculum keeps pace with the times without losing its professional characteristics. This flexible curriculum will help students to choose the programmes that best suit their development according to their personal interests and career plans.

In practical teaching, the combination of theory and practice is emphasised to promote students' learning and application in real projects. Colleges and universities can build internship and project practice platforms through cooperation with enterprises, so that students can improve their innovative and practical abilities in real operations. Specifically, industry-related project cases can be set up to encourage students to work together in groups to carry out research and cultivate the spirit of teamwork and the ability to solve practical problems. At the same time, it is necessary to pay attention to the construction of basic professional courses to ensure that students are equipped with solid basic knowledge while learning new technologies, so as to lay a solid foundation for future professional courses.

3.4 Promotion of School-enterprise Co-operation and Academic Competitions

School-enterprise co-operation is an important strategy to improve the quality of education in computer science. By establishing an industry-university-research platform with school-enterprise co-operation, we can effectively integrate the resources of colleges and universities and enterprises, and form a situation of complementary advantages and mutual benefit and win-win situation. This platform can not only provide students with rich practice opportunities, but also enhance their employment competitiveness. For example, colleges and universities can jointly develop courses with enterprises and invite enterprise experts to participate in lectures to achieve dual-teacher teaching. At the same time, students are encouraged to participate in the actual projects of enterprises, so that they can practise their skills and accumulate experience in a real working environment.

Participation in academic competitions is also an important way to improve students' comprehensive quality. Colleges and universities should rely on traditional academic competitions, such as the Blue Bridge Cup, to increase the number of related competitions covering emerging fields such as artificial intelligence and data analysis. By organising diverse academic competitions, students can not only exercise their practical ability and innovative thinking in the competitions, but also stimulate their interest in learning new technologies. In addition, colleges and universities should encourage students to apply for the College Student Innovation and Entrepreneurship Training Programme and the Science and Technology Climbing Project, and strive to obtain funding for academic projects at the provincial level or above, in order to improve the overall academic level of students.

In conclusion, through the above measures, the education of computer science majors will not only enhance students' professional ability, but also cultivate their innovative ability and comprehensive quality, deliver high-quality applied talents to the society, and lay a solid foundation for achieving high-quality development. Through the dual drive of school-enterprise co-operation and academic competitions, students will be able to challenge themselves and enhance their competitiveness in practice, thus better adapting to the rapidly changing professional environment.

4 Conclusion

An in-depth discussion was conducted on the cultivation of specialised top-notch applied talents of computer majors in the context of new quality productivity. With the development of artificial intelligence, big data and other emerging technologies, the computer profession is facing opportunities and challenges, and there is an urgent need to reform the existing talent training mode to adapt to the rapidly changing market demand. Currently, there are problems such as imperfect theoretical system, insufficient practical links and in-depth school-enterprise co-operation in talent cultivation, which limit the enhancement of students' innovation ability. A series of reform measures are proposed: firstly, to build a talent training system oriented to new quality productivity, and to pay attention to the combination with local economy; secondly, to dynamically adjust the curriculum system, to set up more cutting-edge technology courses, and to strengthen the practical teaching; lastly, to improve the quality of education through school-enterprise co-operation and academic competitions, and to enhance the comprehensive quality of students. Through these measures, high-quality applied talents with innovative consciousness and practical ability can be effectively cultivated to provide strong support for local economic development. In the new stage of high-quality development, the reform and innovation of computer science majors are not only related to the future of the discipline itself, but also closely linked to the national economic and social development. Colleges and universities need to actively respond to the needs of the times, give full play to their own advantages, and cultivate top-notch talents adapted to the new era, so as to promote the sustainable development of society.

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